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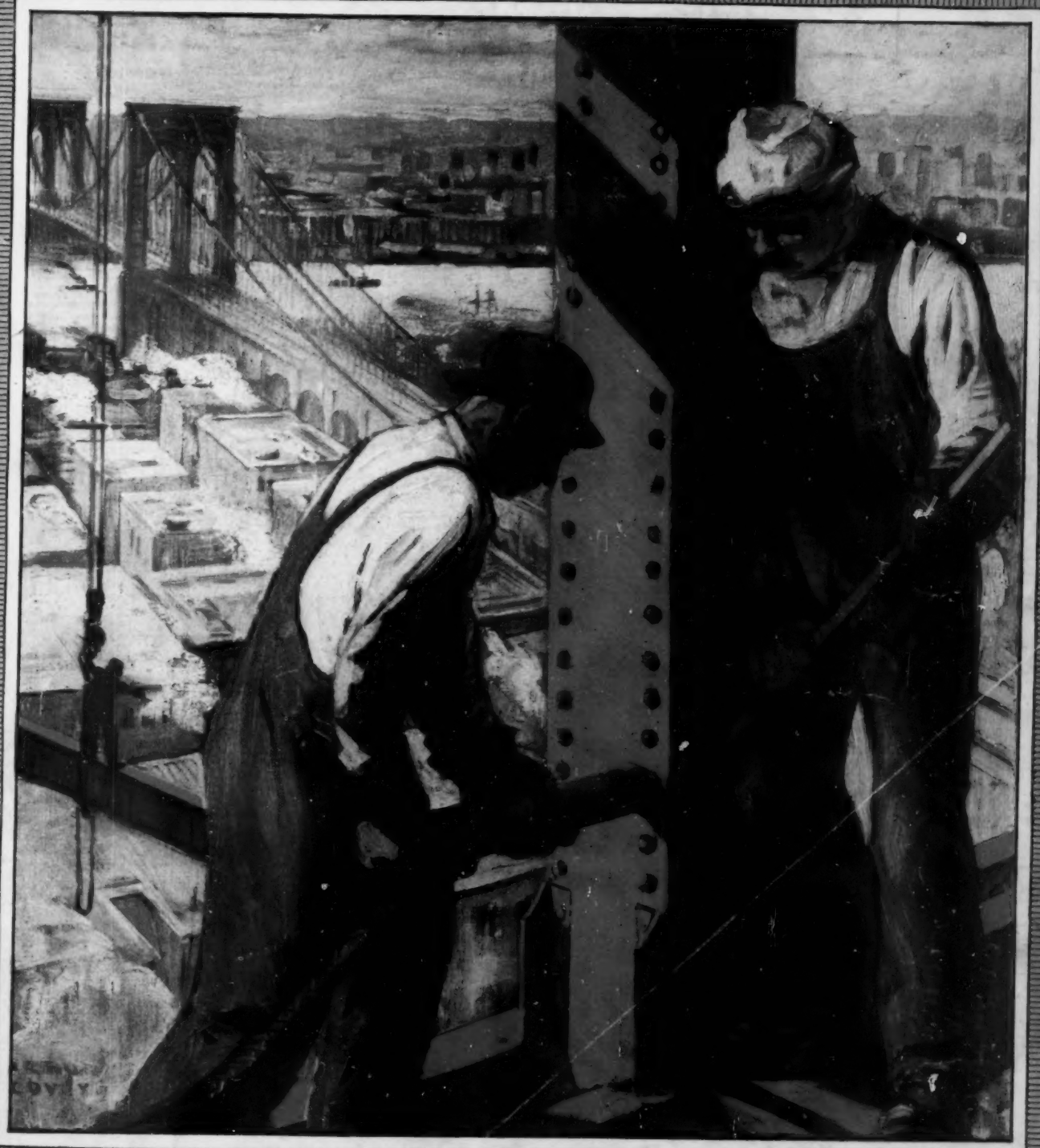
SCIENTIFIC AMERICAN

JULY 5, 1913



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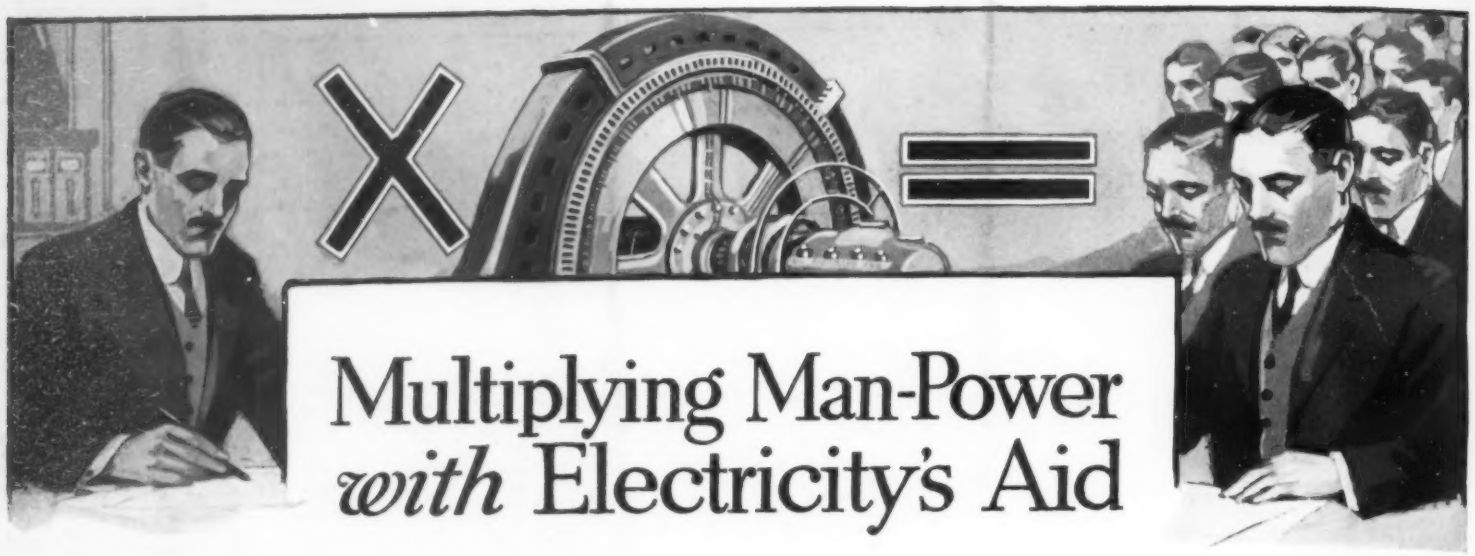
From a Painting by Arthur Covey

Novel Uses of Compressed Air.
The Genealogy of the Motorcycle.
New Developments in Science and Industry.

Vol. CIX. No. 1 Munn & Co., Inc., Publishers New York, N. Y. Price 15 Cents



Multiplying Man-Power *with* Electricity's Aid

TO increase the efficiency of the individual man—to increase the efficiency of groups of men—to increase both by multiplying also the efficiency of mechanical helps—this is the big aim of today.

And that magic word efficiency leads you straight to that magic force—Electricity.

Whether you are a manufacturer or a merchant, a producer or a dispenser, you are directly interested in this problem of multiplying man-power—in knowing how this big aim can be realized *for you.*

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One day he met an electrical engineer who said he could point out an efficiency factor the manager had overlooked—one whereby workmen could be made even more efficient, machines even more productive, and with no change in the present efficiency method.

"No," said the engineer, "I don't mean new machinery. I mean electricity—and not merely a reduction in power expense, I mean that in addition to power saving you can increase both labor and machine efficiency by electrifying your plant. And by so doing I venture to say, you can reduce your costs from four cents to three cents or even two cents per unit."

The engineer went on to show that, while the scientific management had sought to use up or utilize to the fullest extent the physical energy of each man, by electrical means man-power could be conserved and multiplied. Electrical tools, in countless varieties, would help workmen, skilled or unskilled, to do perhaps four times or even sixteen times as much in a day. Individual motor drive would give each operator easy and sure control of his machine. Eliminating line shafting would give more natural lighting and better arrangement of machines. On nights and dark days electric light would provide natural and satisfactory lighting. All these and many other conveniences would contribute to the comfort, health, good spirits, loyalty, accuracy and output of the workers, and make every scheme of scientific management that much more effective.

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He found that with electricity, applied on an up-to-date basis, every machine was more productive; every man was more productive—with less wear and tear on both machines and men—with lower cost and more profit all along the line.

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If you have a problem to be solved, take it up today with your electric power and light company, or with any General Electric dealer or agent in your vicinity. You will find them more than glad to cooperate with you, and no matter how complex your problem may be, they have at their command the service of any part of our organization that may be most helpful to them or to you.

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SIXTY-NINTH YEAR

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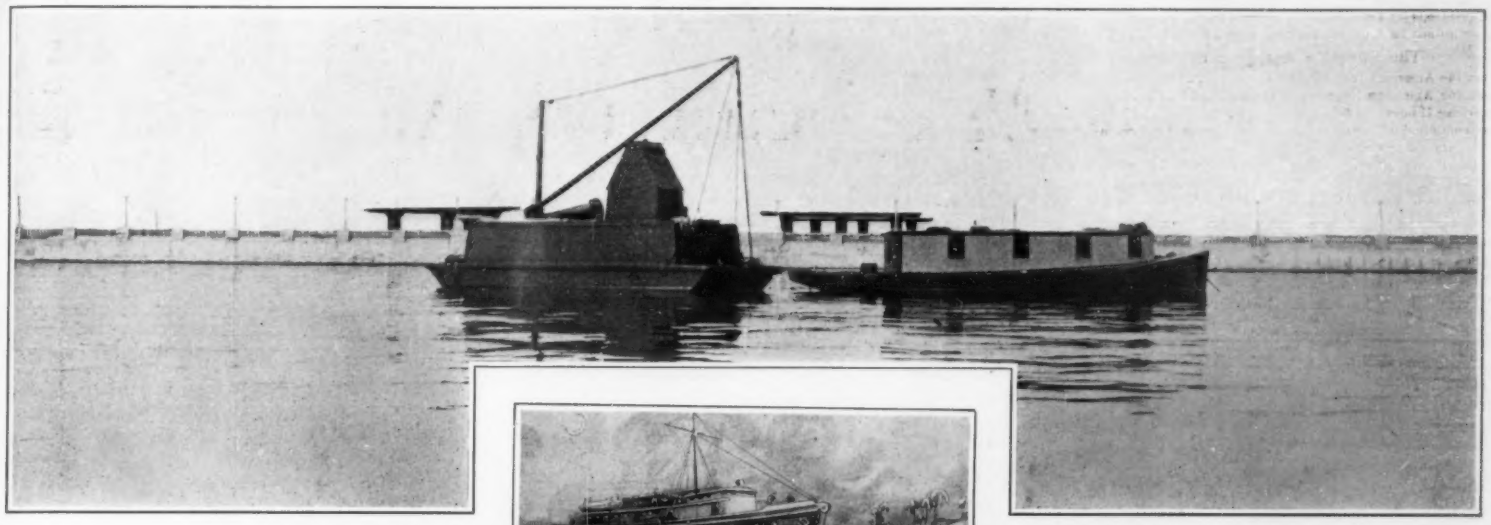
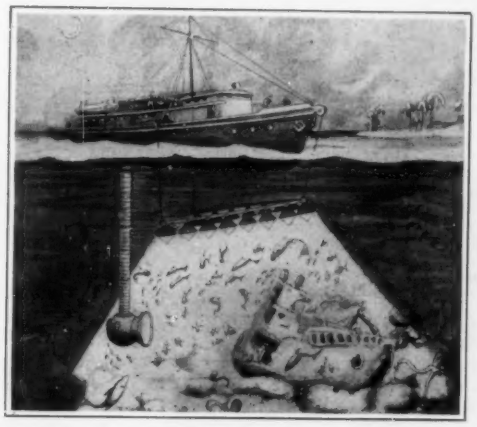
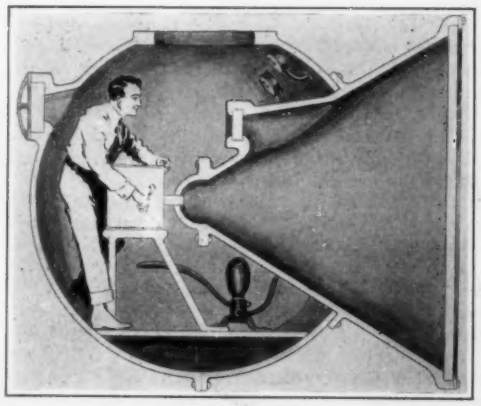


The barge from which the submarine tube was operated.

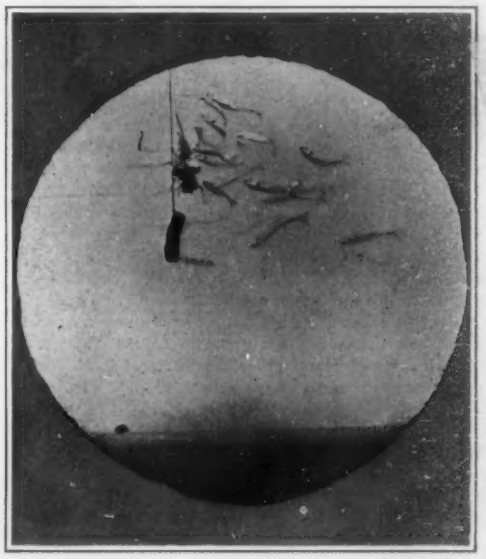
A copy of the Scientific American was lowered to the bottom of Hampton Roads and photographed.



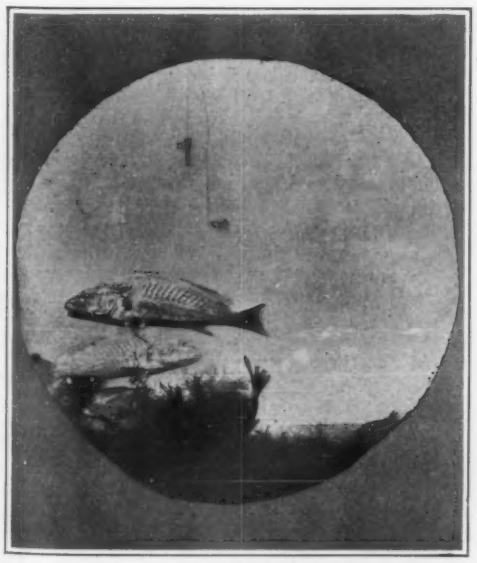
Equipment designed to take moving pictures under water.



Operating chamber to be built for taking moving pictures under water of marine life.



Minnows nibbling at bait. Inexperienced fishermen will now understand what becomes of their bait.



Croakers feeding on the fishing grounds of Hampton Roads, Va.

J. E. Williamson, the photographer, descending to take submarine pictures.

A photograph of a pile made under water, a striking proof of the ravages of worms.

SUBMARINE PHOTOGRAPHY.—A NEW ART.—[See page 6.]

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Munn & Co., Inc., 361 Broadway, New York

The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

The purpose of this journal is to record accurately, simply, and interestingly, the world's progress in scientific knowledge and industrial achievement.

Nature Completes the Panama Canal

THE closing of the sluice gates at the Gatun Spillway on July 1st may be regarded as the final step taken by our engineers in the great work of providing an artificial deep-draught waterway between the Atlantic and the Pacific. It is for nature to do the rest. During the next four months the turbulent Chagres River and the lesser streams of the Panama district will pour their waters into a widespread valley from which there is no outlet. Shut in by the Gatun Dam at the north and the upper lock gates of Pedro Miguel to the south, the surface of Gatun Lake will rise inch by inch and foot by foot. Its ever-widening area will creep silently up the converging valleys until the lake has risen to its working level of eighty-five feet above the mean tide level of both oceans, at which time a vast artificial inland sea of fresh water will have been formed with a total surface area of nearly one hundred and seventy square miles.

There is a certain flavor of poetry and romance in the greater works of engineering, especially in those of a civil character—as every visitor to the Canal during its construction must have realized before he had gone very far over the work. There is something that appeals to the imagination and even to our sense of the dramatic in contemplating the thought that the fierce Chagres River which at the outset of operations was regarded as the most serious problem confronting the canal builder, the most stubborn enemy to his progress, is to-day his best friend, and under his guiding hand is putting the finishing touch to this stupendous work.

Incidentally, in the harnessing of the Chagres River, our engineers will greatly facilitate their struggle against that other great natural obstacle to the Canal completion, the slides at the Culebra cut; for with the rise of the lake it will become possible to flood the cut, and locate at the most troublesome point of sliding, the two extremely powerful dredges which are now approaching completion for the Isthmian Canal Commission. These dredges with their monthly capacity of 1,000,000 yards will probably be able completely to control the situation and take out the sliding material as fast as it comes in, and at a cost far below that possible with steam shovels. Furthermore, their great capacity makes it certain that such slides as may from time to time occur during the operation of the Canal, will never become so serious as to hinder the flow of traffic.

Reversing the Locomotive

THERE are some popular technical fallacies, so strongly entrenched in public belief that they survive in spite of reiterated contradiction. Among these is the belief that the first thing a locomotive engineer does, or one of the first, when he sees that a collision is inevitable is to apply the brakes and reverse his engine.

As a matter of fact, we doubt if one in ten thousand of the locomotive engineers of this country would be guilty of the absurdity of reversing his engine and applying his brakes at the same time. There was a day in the earlier history of railroading, when an engineer would have been considered remiss in his duties if he did not in an emergency reverse his engine; but with the growth of technical knowledge it has come to be understood that to reverse the engine after applying the brakes is to defeat the very object for which the train brakes are applied.

In justice to the early locomotive engineers, however, it should be remembered that only the tender of the locomotive carried brakes, not the engine itself; and under those conditions the reversing of the engine applied an additional though comparatively small retarding effect, supplemental to that afforded by the tender brakes.

We refer to this matter in conjunction with the intelligent letter which we publish in our correspondence columns, from which it is evident that our editorial of June 21 is liable to be misconstrued. Our reference to the necessity for quick control of the reversing gear was not intended to convey the idea that the SCIENTIFIC AMERICAN advocated the reversing of the engine when the engine brakes were applied. In saying: "Only a stop which would reverse the power would be of any service *when air brakes proved inoperative* at crucial moments," we were pointing out that should the air brakes fail entirely, as it is claimed they did in the Stamford collision, the only thing left for the engineer to do would be to reverse. This would have some effect, though retardation due to the locking and sliding of the wheels on the rail would have an insignificant effect upon the momentum of the whole train.

The folly of reversing when there are brakes on the engine and these brakes are set is evident if we remember that, when the engine is running with the brakes applied, the retarding effect is due to the large aggregate area of contact between the brake shoes and the tread of the wheels; whereas, when the engine is reversed, the frictional area of the brake shoes is replaced by the very small area of the sliding surfaces in contact between the tread of the wheels and the rails with the result that there is an immediate large reduction of the retarding effect of the engine on the train behind it.

The Problem of Marine Oil Engines for Ocean Liners

THE constructive optimism which is so valuable an asset in the development of new inventions frequently leads to their application on a scale which is not guaranteed by the actual practical development of the art. It begins to look as though the installation of exclusive Diesel engine and other oil engine plants of large powers in big ocean steamships was a case in point. We say this with the full appreciation of the fact that the work of the German engineers in this direction has been both brilliant and courageous and marked by a lavish expenditure of brains, time and money. Although the leading builders of large marine oil engines are not discouraged, they realize that a large amount of research and experimental work must be accomplished before oil engines can be built in sizes much larger than the largest that are now in service. The difficulties are chiefly those which arise from severe temperature stresses, and from the complicated valve mechanism.

It is certain, then, that the large oil engine has by no means reached its final stage of development; and we may look for some radical changes, particularly in the direction of simplifying the main constructive elements of the oil engine, in reducing the number of its parts, and in obtaining a better control of the ever-insistent problem of temperatures.

As matters now stand, the most expert oil engine builders of Germany do not see much immediate hope of the installation of complete oil plants for driving the largest steamships. The most that they are willing to consider at present is the possibility of installing a mixed plant of steam turbines and oil engines, such, say, as a powerful oil engine on a central shaft with steam turbines driving the wing propellers.

Let it be clearly understood that the above is written with the problem of the oil-motor-driven battleship and liner in mind. In the smaller powers the success has been so marked as to render certain a very large displacement of steam by heavy oil. Furthermore, some of the problems which complicate the question of large power units on the sea—say, of from 10,000 to 12,000 horse-power—are not so serious when the plant is designed for stationary service on land; and here we may look for a steady if not rapid increase in dimensions and powers.

Bombarding a Defense With Dirigibles

THE aspect of a huge rigid airship of the Zeppelin type, 500 feet in length, of 25,000 cubic meters capacity, capable (as they soon will be) of attaining a speed of 70 miles per hour, carrying machine-guns, both in the cars below the envelope and on a platform on top, and transporting a load of 8 to 10 tons, with a range of action of 3,000 miles, and implying the menace of the release of half a ton or more of explosives at one "drop" on dock gate, arsenal or warship, is extremely formidable. When one considers that the dirigible can travel at night, and hover silently with stopped engines over the target which it is intended to destroy, the menace is more serious still.

There is, however, another side to the question. In the first place these large airships are very awkward to handle near the ground and once aloft must keep there until they can return to their special shed. They cannot ride out a storm at anchor, but must either try to drive through it on their return from a voyage, which is a risky proceeding if the wind is contrary, or they must drift and lose ground and be driven far away from their shelter. Their supply of fuel is limited, so that in either case they may have to use it up, and once it is exhausted they are doomed to destruction. If they carry explosives they must reduce their fuel reserve.

Secondly, the airship, as an engine of war, and not merely a means of reconnoissance, has yet to prove its value. Mr. Hudson Maxim declared some years ago in a lecture to the Brooklyn Aeronautical Association, that a high explosive which should be so powerful and destructive when employed in aerial bombs as to fulfil the expectations and predictions of the scaremongers, could not be made; even dynamite to do much damage required to be confined. The destructive power of shells and torpedoes is undoubtedly enormous—always provided that the conditions are favorable, but never so great as the average man supposes, especially if he has been through a short course of blood-curdling aerial fiction.

The effects of the battering of modern heavy naval guns on a battleship and its crew, as described by eye-witnesses on board Russian vessels in the Russo-Japanese war, are impressive to a degree, but the shells in such a case are directed with enormous propulsive force from rifled guns against solidly resistant structures of wood and metal, not merely dropped from a considerable height to the earth, among buildings.

Experiments with dropped live shells and explosives have shown that while they might land within a remarkably short distance of the target, it was just that distance which made all the difference in the resulting damage, for the effects of high explosives are very local and the momentum attained by any heavy object falling from a considerable height is such that it buries itself in the ground and the force of the explosion caused by a percussion fuse is thereby neutralized. This does not imply that bombardment from aerial machines would be entirely ineffectual, but if we may judge from the analogy of the results within the memory of man of artillery practice against towns and villages, it would not be worth the expenditure of time, energy and ammunition, nor the risk of life involved. Ladysmith stood the battering effects of twenty odd thousand shells with practically no damage. Similar results attended the bombardment of the forts round Pretoria, and lyddite shells, though they dug cavities and made openings in the walls of the Dervish fort outside Omdurman, did little or no real damage. In none of these cases was the bombardment a factor compelling the surrender of the garrison.

Thirdly, the dirigible is notoriously a large and very vulnerable target for artillery, if it should descend to within 5,000 feet. That it would be difficult to hit while going at full speed cannot be doubted, but it cannot make use of its superiority over the aeroplane as a platform for bomb dropping, unless it stops its engines and hovers vertically over the target at a height well within easy range of the guns. It is difficult to believe that the most practised bomb-dropper could hit any of the smaller buildings, otherwise than by chance, from a height of 5,000 to 6,000 feet, and the gunner would have a good opportunity of bringing down the airship while it remained stationary.

It may be presumed, therefore, that the efforts of the dirigible would be confined to reconnaissance by day with a view to marking down certain points for attack by night. With a favoring wind and under cover of darkness the pilot would subsequently endeavor to place himself in a position to drift silently, with stopped engines, until approximately over the chosen target, the bearings of which would have been ascertained by reference to the map, aided possibly by espionage during peace and checked by previous reconnaissance. The bomb-dropper would then employ the searchlight turned on at intervals, and having located the position, would drop his bomb, and the airship would cast out ballast and use engines and planes in order to rise quickly and to get out of artillery range and away from the scene of action. By this time, of course, the alarm having been given, the enemy's searchlights would have been sweeping the sky and might or might not pick up the aerial intruder. Until recently it was considered a matter of difficulty to do so, but the French, in conducting searchlight experiments to trace the whereabouts of the "Adjutant Vincenot" just before the Luneville incident, appear to have found it a comparatively simple matter.

Engineering

New German Imperial Yacht.—The German Emperor's new yacht "Ersatz-Hohenzollern," which will be an ocean-going vessel of 7,000 tons displacement, is to have geared turbines with the Föttinger system of reducing gear. The readers of the SCIENTIFIC AMERICAN will remember our publication of a 12 days' continuous test of the Föttinger transmitter, in which 90 per cent efficiency was secured. The results were so satisfactory that this transmitter is considered to be available for ships of the "Imperator" size.

Russian Naval Development.—It is reported that four large battle-cruisers are to be laid down this year in the Russian yards, and that they will be among the largest of their class in existence, each ship being of 30,000 tons displacement and driven by turbines of 75,000 horse-power. Also eight torpedo-boat destroyers of the largest size, similar in design to the "Novik," are being built, the hulls in Russia and the turbines by the Vulcan Company of Hamburg. These ships will be of 1,280 tons displacement and will be designed for 35 knots. The "Novik" made 36 knots on trial and is to-day the fastest ocean vessel afloat.

Kerosene Electric Rail Coaches.—Six railroad cars driven by electric motors supplied with current from kerosene electric generating sets are being built by the British Westinghouse Company; one for the Cuban Central Railway, one for the London Northwestern Railway, three for the Nordmark Klarelforens Jarnvagaktiebolag, Denmark, and one for the New Zealand government. The engines used are of the six-cylinder type, having a bore and stroke of 5½ by 6¼ inches, respectively, and developing 90 horse-power at 1,160 revolutions per minute. Kerosene is used as fuel by vaporizing it in a G. C. vaporizer which displaces the ordinary muffler. Gasoline is used for starting purposes until the vaporizer is heated.

Diesel Engine Towboat.—The new towboat "Savoia," which is in use by the Italian navy, is noteworthy from the fact that it is equipped with Diesel oil engines. Though its displacement is only 170 tons it carries a 280 horse-power engine of the four-cylinder, two-cycle type. It runs at 250 revolutions per minute and is started or reversed by the use of compressed air at a comparatively low pressure. A compressed air tank on board carries enough supply to furnish sixty starting or reverse operations, and these are said to take but a few seconds. Owing to these advantages, the new craft is a remarkably easy one to handle.

Welding Copper with the Oxy-acetylene Flame.—A process of welding copper with the oxy-acetylene flame has been developed by a German inventor named Carl Canzler. He has found it necessary to use larger torches than for iron welding, but in general the process is similar, except that he employs a liquid welding paste, and a special copper welding wire. The paste prevents the formation of oxide. The process has been used for welding copper plates up to an inch in thickness. The weld will withstand acid and its strength is equal to that of a continuous solid copper sheet. The process is being used in the principal copper works in Germany with great success.

Device for Testing the Hardness of Steel.—A very simple device has recently been invented for testing the hardness of steel by impact. It consists of a tubular standard fitted with a hardened steel ball at the lower end, which is placed upon the steel to be tested. At the upper end of the standard is a spirit level by which the standard may be brought to true vertical position. Mounted on the standard is a cylindrical drop weight. This is raised to the top of the standard and then dropped, striking a weight-receiving block at the bottom of the standard, which communicates the impact to the steel ball, and makes an indentation in the steel that is being tested. By measuring the diameter of the indentation with a celluloid scale the hardness of the steel may be determined.

Natural Gas Near Hamburg.—As natural gas does not occur frequently in Germany, the example pointed out by Dr. Strache of a gas well at Neuengamme, near Bergedorf in the Hamburg region, is worthy of remark. The gas leaves the ground at high pressure, about 25 atmospheres, it is said. The city of Hamburg intends to make use of the gas, and is at present engaged in laying a pipe line so as to bring it to the several gas works, where it will be mixed with coal gas, so as to lower the cost of production. Part of the supply will also be used to operate an electric station, and this will be erected at the gas well itself. One peculiarity of the natural gas is that it is almost entirely made up of methane or marsh gas.

Science

The Welfare of University Students.—The Congress organized by the National Union of Students' Associations was held at Paris during the month of May and was an event of considerable interest and numerous matters tending to promote the welfare of university students were discussed. What is known as the International Federation of Students is now being organized, and is intended to bring students of all nations into closer relations than before.

The Death of Prof. Verneuil.—We have to record the decease of the French scientist Verneuil, who occupied a leading position as professor of glass-making and ceramics. To him are due many interesting researches and practical methods in various fields. In connection with M. Wyrouboff, he carried on productive researches upon thorium and cerium, and he acquired some celebrity for his work in artificial production of the ruby as well as in manufacture of optical glass.

The Congress of British and French Electrical Engineers.—An interesting event was the Congress of British and French electrical engineers which was held at Paris May 21st to 24th, on which occasion numerous members of the British Institution visited the capital and took part in the conferences, visits and receptions organized by the home institute. Papers were read upon electric traction, power production subjects and others, and the delegates visited the St. Denis and other large city plants, the Metropolitan subway and electric stations and various points of interest. M. Georges Claude gave a lecture upon luminescent tubes (neon tubes, etc.), and Com. Ferrié upon wireless telegraphy, with special reference to the Eiffel Tower plant. After visiting Versailles and the Buc aeroplane grounds, the members returned to Paris by the electric railroad. On the whole, the visiting members were quite pleased with their stay at the capital.

The Ascent of Mt. McKinley.—On June 7th, Archdeacon Hudson Stuck, accompanied by Robert G. Tatum, Harry P. Karstens and Walter Harper, reached the top of the south peak of Mt. McKinley. Barometric observations which were made by Dr. Stuck are said to indicate that the height of the mountain is 20,500 feet. The expedition, which left Fairbanks on March 13th, expected to reach the summit of Mt. McKinley early in May, but was delayed three weeks in cutting a passage three miles along ice, thrown across the ridge last summer by an earthquake.

The Canadian Arctic Expedition was definitely begun on June 17th, when the whaler "Karluk," commanded by Capt. Bartlett, and having on board ten of the scientific staff and a crew of fifteen, sailed from Victoria, B. C. The leader of the expedition, Vilhjálmur Stefánsson, expects to join the party at Nome, Alaska, about July 20th. At Nome the expedition will divide into two sections, one of which, under Stefánsson, will sail north in the "Karluk" to seek the unknown lands supposed to exist on the poleward side of the Beaufort Sea, while the other, under Dr. R. M. Anderson, will proceed westward in the small auxiliary gasoline schooner "Alaska" and will endeavor to reach a base in southwestern Victoria Island, from which point extensive explorations and investigations will be carried out. (Some preliminary plans of the expedition and a chart showing the proposed routes will be found in the SCIENTIFIC AMERICAN SUPPLEMENT of May 3rd, 1913.)

Further Results of the Mawson Expedition.—The experiences and achievements of Mr. Frank Wild and his seven companions, who formed the second base of the Australasian Antarctic Expedition, have just been made public. After leaving Mawson and the main party at Adelie Land, the second detachment sailed westward along the Antarctic coast, under orders to form a base on Sabrina Land or Knox Land. The former land was found not to exist, and ice prevented access to Knox Land. Finally the party was landed, with its stores, on a lofty moving glacier, which Wild thinks was mistaken by Wilkes for "Termination Land." It was named "Shackleton Glacier." From this base surveys were made all along the coast from 101 degrees east longitude, on the east to the point reached by the German expedition of 1902 on the west, besides penetrating inward—in one place 50 miles. The main result of these explorations was the discovery of a tract of land having 350 miles of coast, and probably extending south to the pole, which the explorers named "Queen Mary's Land." On an island 65 miles west of the expedition's base was discovered the largest rookery of Emperor penguins heretofore recorded. Some 7,000 young Emperor birds were found here, besides innumerable ordinary penguins. The Mawson expedition as a whole may be said to have resulted in the accurate delineation of about 1,000 miles of new coastline.

Aeronautics

A Lucky Escape from a Hail Storm.—The Chalons district for twenty miles around Vitry le François experienced a terrific hail storm early in the evening of May 9th. So violent and lengthy was the storm that the ground was covered to a depth of several inches with hail stones. Many persons were injured and two military aviators who were returning from Rheims raced with the approaching storm and landed just as it broke. The aeroplanes were badly damaged by the hail and one of the pilots was injured. Although an aeroplane can fly in a pelting rain, it is doubtful if the machines in this instance would have descended safely if they had been overtaken while in flight by the hail storm.

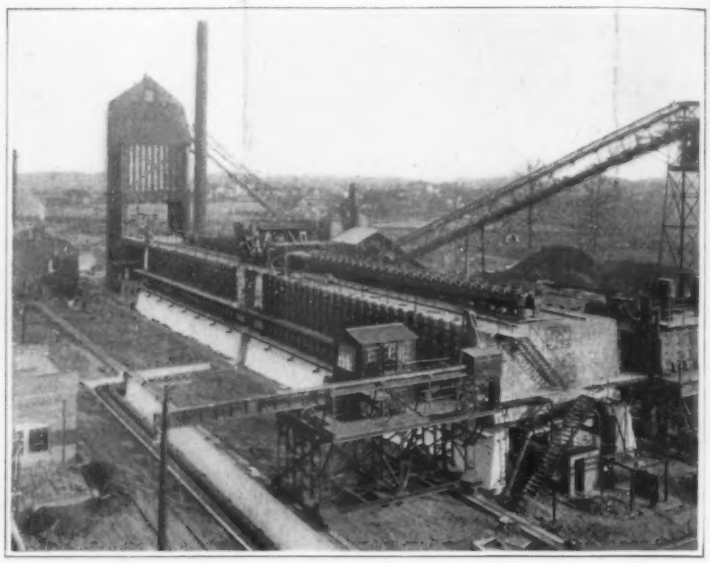
Moreau Anonymously Assisted.—An anonymous contribution of $2,000 was lately received at the National Aerial League, at Paris, in order to enable Engineer Moreau to proceed with his aeroplane method, in which he secures a remarkable stability. The value of his invention is now beginning to be recognized, but although he was able to proceed with his work by the aid of a private subscription, he was obliged to stop when this became exhausted. However, the French army is likely to take the matter up soon, as it is claimed that the Moreau aeroplane realizes a complete automatic stability. In a recent flight made by Lieut. Sulnier, the aeroplane was able to fly for 35 minutes in rather rough weather without having the pilot operate any of the steering parts. As M. Moreau said he would do, he made the entire flight with folded arms, which appears to be a remarkable feat.

Sahara Flights.—A very successful aeroplane flight over the desert of Sahara was recently made by four Farman biplanes mounted by French army pilots. What is noteworthy is that the trip, covering about 500 miles distance, was made above the desert region where any kind of aid is impossible. Starting out from the military aeroplane post which was recently established at Biskra on the edge of the desert and in the Algerian region, the party proceeded with the object of making the flight to Touggourt, a military station lying in one of the oases, and this was done very easily by the whole party. Then the return trip was made without any incidents, clearly showing the value of the aeroplane in making communication over desert country. As the French army possesses a number of military posts in the regions of Algeria and Morocco, the aeroplane is certain to be of great value in the future in making a rapid connection.

Instruments for Aeroplane Research.—At the recent Royal Society Soiree, Mr. Mervin O'Gorman exhibited numerous instruments used in aeroplane research. Two of these were instruments for measuring the tautness of wires employed in aeroplane and airship construction. The principle of both is the same, one being somewhat larger than the other and reading to higher stresses. In these meters the wire is passed over three points out of alignment, the middle point being connected by a lever with an indicator. If the stress on the wire increases, the middle point is drawn in and the movement is shown on a dial calibrated in pounds or tons. The meter has to be calibrated before actual use on aeronautic wire, by means of suspended weights. It has been shown by its use during flight that the load that comes on the wires of aeroplane wing framing is often actually twice the dead weight loaded on the wire. The instrument is especially intended to show the variation of stresses during flight.

The Mackay Army Aviation Cup.—Mr. Clarence H. Mackay has presented to the War Department, through the Aero Club of America, a large silver trophy to be competed for by the military airmen of the United States Army in a series of reconnaissance competitions. The first of these was held at College Park, Maryland, on October 29th, 1912, and was won by Second Lieut. Henry H. Arnold of the Twenty-ninth Infantry. No definite date has been set for future competitions. The competitors must fly on the same day if practicable, after having been notified two weeks before the event. The tests are to be passed upon by a board of five judges. The highest average rating obtainable will be 300 points, which allows 50 points for each of the six events. The tests include accuracy of location, accuracy in estimating troops, character of written report, time of reconnaissance, altitude requirement and landing accuracy. The height average is put at 1,500 feet. Any competitor dropping below 1,000 feet will be disqualified—this because flying at low heights would be suicidal in actual warfare. Mr. Mackay's cup is of solid silver, thirty inches in height, and stands on a block of Circassian walnut. On the rim at the top of the cup are the figures of four women holding in their outstretched arms four small aeroplanes of the biplane type.

Coke ovens with bins and washery, showing enormous development of smoke. Masontown, Pa.



General view of a retort coke oven plant of large dimensions and favorably situated.

The Beehive and By-product Oven in Coke Production

COKE is produced by three methods: In the beehive coke oven; in the by-product oven; and as a by-product of gas works. The last being spongy and unsuitable for metallurgical purposes need not be considered any further.

Millions of tons of metallurgical coke are annually consumed in the United States in the manufacture of iron and steel. This coke must be dense and firm so as to sustain the superincumbent charge in the furnace without being crushed; it must also be substantially free of sulphur.

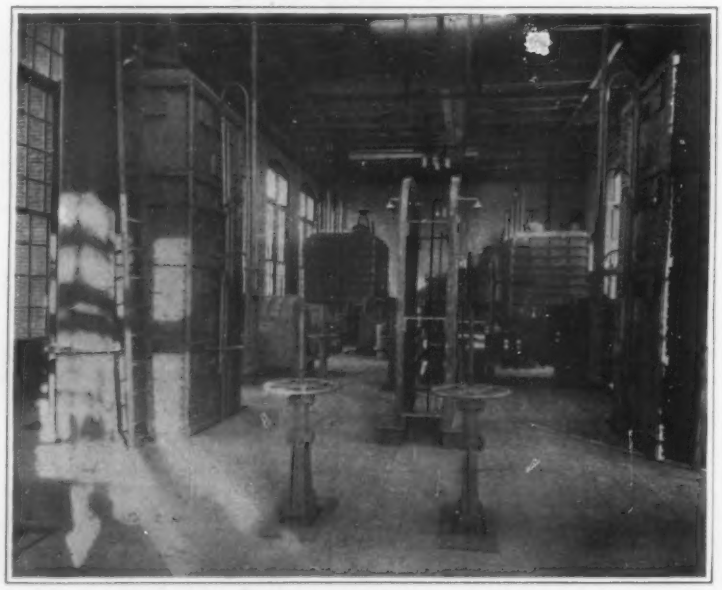
From the shape of the beehive oven the origin of the name is apparent. In this oven, the coal is coked by the burning of the gases evolved and a part of the charge of coal. One hundred tons of coal will produce about sixty-five tons of coke. There are no by-products, the gases of distillation inclusive of tar and ammonia having been burned in the coking process. The smoke and soot arising from a beehive oven plant create such a nuisance that no city would tolerate it in its vicinity. While the process is wasteful, it is still able to survive against the competition of the by-product coke oven because of the small capital required for its installation. The coke produced is of excellent quality.

The by-product oven plant requires the investment of large capital, but its operation is much more economical; moreover, the smoke nuisance is absent. One hundred tons of coal will produce about seventy-five tons of coke, one thousand gallons of tar, twenty-three hundred pounds of sulphate of ammonia, and four hundred and fifty thousand cubic feet of illuminating gas. The tar and ammonia alone will pay for the cost of maintenance, operation and interest on the capital invested. It is therefore evident that the days of the beehive oven are numbered. In Germany, the beehive oven was replaced by the by-product oven years ago.

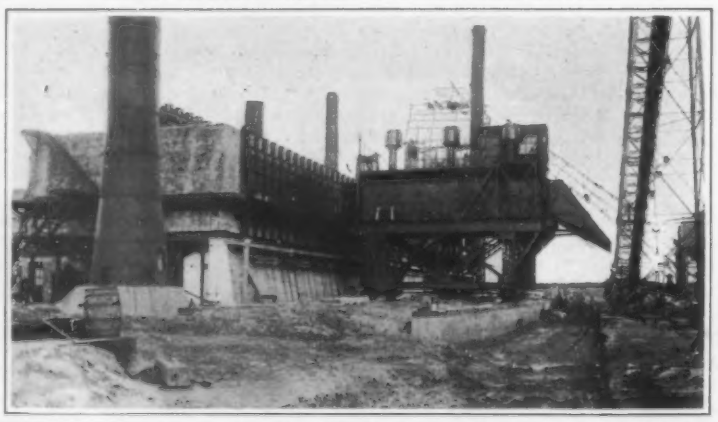
The greater part of the illuminating gas of the by-product oven goes to waste except where the plants are located within a reasonable distance of large cities which can use the gas. Any returns from the gas are an additional gain to the by-product plant. We may look therefore for a further reduction of the price of gas in some of the favorably situated cities.

Bituminous coal is used for coking, but not all of that kind of coal is suitable therefor. It is necessary that at the proper stage of coking, the particles should soften and cohere, and form, after cooling, a solid mass. Recently the difficulty of non-coking coals has been overcome. When distilled gases, which consist mostly of hydro-carbons, are passed through an incandescent charge of coal, they are "cracked," that is, the more complex molecules are broken down to form simpler hydro-carbons. In this breaking down process carbon is split off from the molecules and deposited between the particles of the incandescent charge. The carbon atoms at the moment of their deposit have the peculiar property of binding the particles of the charge together; the name "cementitious" carbon has therefore been given to the material thus deposited. At the same time the coke is enriched by this deposit of pure carbon. The silvery gloss of coke is due to this carbon deposit. Where the distilled gases are first passed through gas washers before passing through the incandescent charge, the tar and ammonia may be recovered.

Building a beehive coke oven.



Interior of condensing house of a retort coke oven plant.



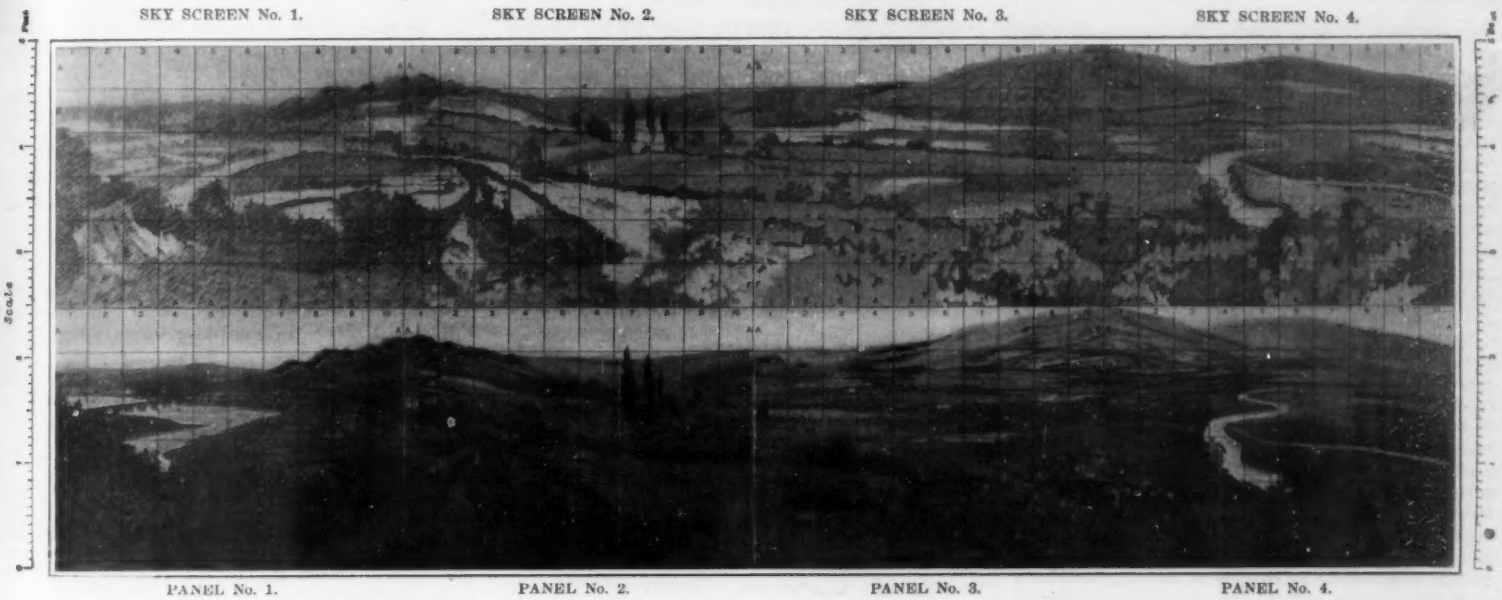
The traveling structure on the right is the quencher, into which the hot coke is taken.

The operation of the coke oven, whether beehive or by-product, is intermittent. After charging the coking chambers with coal, heat is applied to coke the same. In the beehive oven, as stated above, combustion within the chamber itself furnishes the heat; in the by-product oven heat is applied externally to the retort by the combustion of gas in the heating flues located in the heating walls between adjacent retorts. When the coking is completed—after 48 to 72 hours—the coke is quenched or cooled by spraying water on it, or in airtight receptacles. This method furnishes a superior coke.

Recently coke ovens have been constructed in which the coking operation is continuous, coal being fed into the retort at one end and quenched coke coming out at the other. The "green" gases distilled off at the forward end are made to pass through the incandescent charge at the rear end, thus enriching the coke and binding its particles together.

The specific gravity of coke as compared with coal is low. This is due to its porosity caused by the escaping gas during coking. But when the coke is compressed within the retort, after the volatile matter has been driven off, while it is still plastic and before it becomes incandescent and brittle, a very dense coke resembling anthracite is the result. Such anthracite is now produced on a commercial scale.

There are two objections to the use of bituminous coal: One is the smoke nuisance, the other the poor utilization of the hydro-carbons when burned in the ordinary furnace. When fresh coal is thrown on the fuel bed, volumes of smoke and gases are generated, whose combustion is incomplete. Not only are these gases lost, but their generation absorbs quantities of heat from the fuel bed. Recent methods have produced a smokeless fuel by subjecting bituminous coal to a partial coking operation. The coal is heated in retorts at a comparatively low heat, 800 to 1,000 deg. Fahr., which expels the heavier, smoke-producing hydro-carbons, and renders the coal thus treated smokeless. In this way the smoke problem is solved and the constituents of the coal, tar and ammonia may be saved.



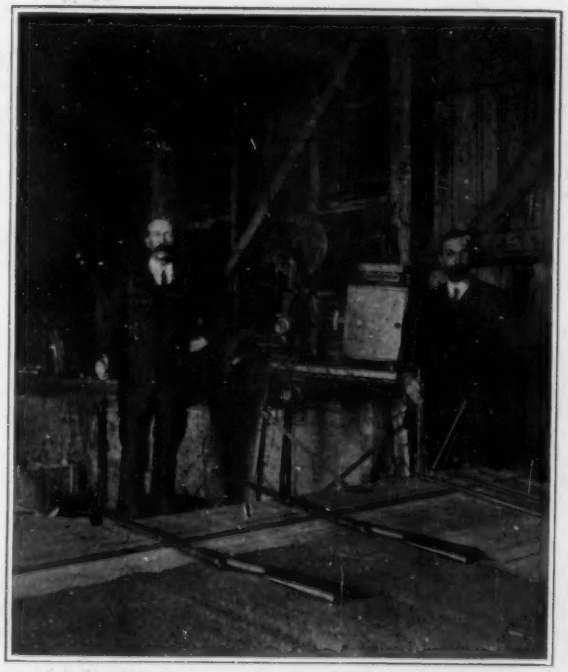
Section fire target (Solano system). Landscape No. 1.

Teaching Soldiers How to Shoot

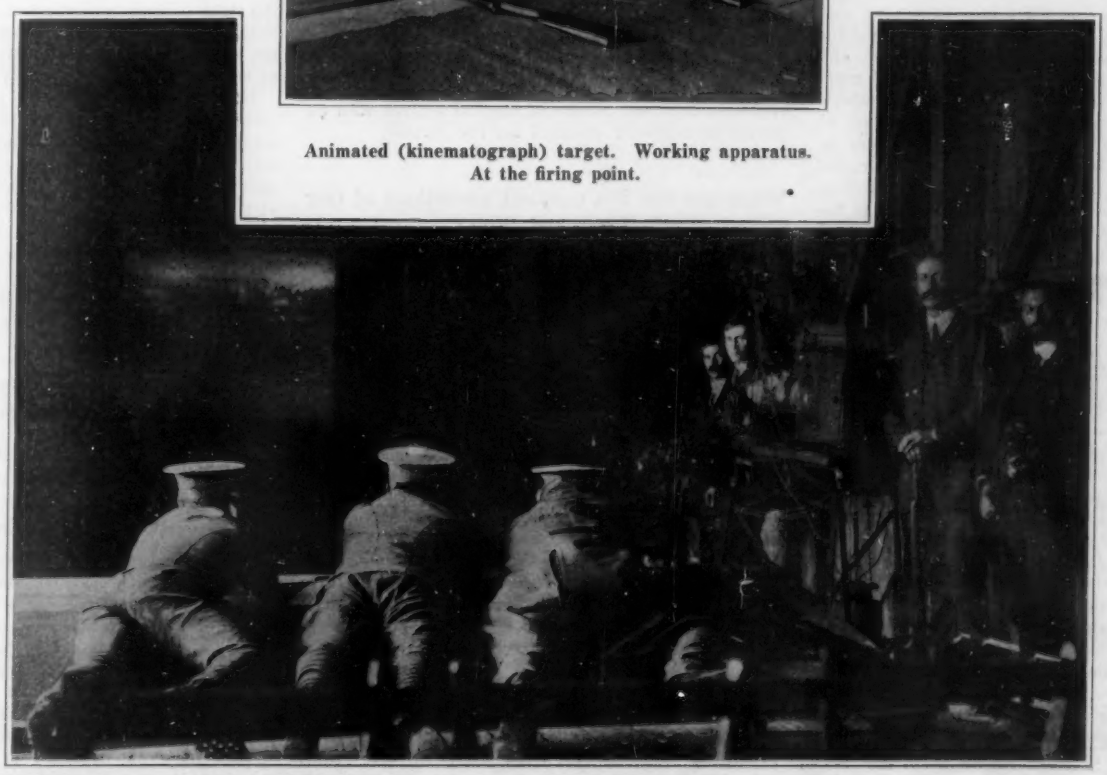
How Artificial Landscapes and Moving Pictures are Used

By Major H. Bannerman-Phillips

TIME was when the soldier was instructed to reserve his fire until he could see an enemy's features distinctly, when the range at which the accuracy of the firearm of the infantry soldier could be relied upon with anything like reasonable certainty did not exceed that of the "cloth-yard shaft," truly sped by a trained archer of the days of Agincourt with his long bow of good English yew. In modern warfare, the power of the military rifle enables the cylindrical, pointed bullet to be propelled to distances far beyond those at which the eye can distinguish the human target. Painstaking experiments have demonstrated that on the battlefield it is generally useless for soldiers to shoot at individual enemies at anything beyond six hundred yards, and musketry experts consider that beyond that range all rifle-firing in battle should be "collective," that is to say, that men should fire under the command of a leader, who indicates the target or object of attack, and the particular point or portion to aim at, and who gives the range at which to set the sights of the rifles. This is not to say that men with good eyesight and sound training cannot hit the mark at much longer distances. The idea is merely that for practical purposes men are doing better for their own side in shooting under orders, while using their best efforts to strike a definite target, when that target is over 600 yards distant. In the Boer war some remarkably good shooting under service conditions was seen occasionally on both sides. Outside Ladysmith on the Helpmaknar road a single Boer for some time made it certain death for a British soldier to expose himself on the side of a kopje two thousand yards distant from his deadly tube, and at Rangeworthy Heights a few steady picked shots on the British side kept a much superior number of Boers lying down in their shelters for three days, so sharp and unerring was their fire.



Animated (kinematograph) target. Working apparatus. At the firing point.



Animated (kinematograph) target. As seen from the firing point. Note that the rifle-sights are in daylight.

For half a century before the Boer war the British government had expended much energy and a corresponding amount of public money in the praiseworthy endeavor to evolve the best military "shooting-iron" in the world and the most efficient ammunition to use with it, and in the end it was found that the skill of the soldier had not kept pace with the improvement in his weapon. The unpleasant truth was driven home that the standards of military shooting were inaccurate and misleading, based on false conceptions of what was essential to efficiency. The authorities realized, in fact, that it was of less importance to provide better rifles than to evolve from bitter experience more suitable methods of instruction. The training of the individual officer and soldier, under conditions of visibility approaching to those of the battlefield, was of more importance than the achievement of a high standard of excellence at marks which could be more or less clearly distinguished from their surroundings. So far did the average skill of the marksman lag behind the standard of efficiency of the really excellent weapon which he carried, that it was estimated that about fifteen hundred rounds of ammunition were fired during the Boer war for every man struck on the enemy's side. Much of this waste of ammunition—in fact, probably three fourths of it—was due, not to inaccuracy of aim, but to fire misdirected, that is, directed at a part of the battlefield where the enemy was supposed to be, but was not. Out of the remaining fourth more than half

was expended in shots which were true in direction, but fired with the sights at the wrong elevation, owing to error in judging the range. Then again the greater number of bullets which did not find their billets at ranges under 600 yards were probably wasted, because the men fired under conditions which do not obtain in peace time, namely, that the firers were themselves under fire, and consequently inclined instinctively to keep the head down, and frequently because they could see no enemy at which to direct their fire, although they heard his missiles strike near them and whiz past, or saw their comrades struck down and felt that they must retaliate without delay.

Failure to distinguish the target and judge the range, difficulties which often go hand in hand, are harder to deal with than want of accuracy of aim at a visible target, and it is against these difficulties that modern methods of instruction in rifle shooting are or should be directed. The purpose of musketry training should be in the first instance to make the individual soldier proficient in the use of his rifle, conversant with the power of the weapon, and confident in his own skill and judgment. He should next be trained to use that skill under the leadership of his commander so as to give the best results for his own side. His leaders and he should alike be capable of shooting accurately at a given object, and able to recognize and describe any objective or target against which rifle-fire may require to be directed on service, and to judge the distance to it from their position at the time. Finally, he should acquire self-control, and cheerfully and intelligently submit to the necessary fire-discipline exercised by leaders who are acquainted with the intentions of the commander who directs the fire, and whose duty it is, not to augment the volume of fire themselves, but to concentrate their attention on the objects to be attained, select the targets in order of importance with regard to those objects, and direct and control the fire of their subordinates. Having been "through the mill" themselves, and become experts in handling a rifle in the first instance, their training is carried further for purposes of leadership, to the end that they may make the best possible use of the shooting powers of their subordinates.

Besides being able to shoot steadily and accurately when there is ample time to take aim, a man must be prepared to fire with or without the bayonet fixed, at moving objects, and to get in several shots in rapid succession with undiminished accuracy at cavalry charging, or to repel an attack at close quarters or a rush of savages. He must further know how to allow for wind, and how to take advantage of every kind of cover while firing, so as to expose himself as little as possible to the view and fire of an enemy.

Much of the mechanical portion of his training can take place indoors, on the barrack-square, and on the rifle range. Muscle exercises to strengthen the special muscles brought into play, aiming, trigger-pressing (a most important detail and connected with breathing), firing standing and kneeling, firing prone, firing sitting, fire discipline, taking advantage of cover, rapid adjustment of sights in accordance with orders—all these can be taught both by precept and example, in or near the barracks; but when men have been well grounded, they have to be taken into strange ground for further visual training, judging distance practice, and field firing. In a civilized and closely inhabited country the difficulty is encountered of providing suitable ground of varying character and sufficient extent to allow of firing at short or long distances, as may be required, in tactical schemes, with safety under service conditions. Also there is the difficulty of marking the shots, so that men may have some idea as to the results of the shooting, as they would have when firing at stationary or moving targets on a rifle range.

Various ingenious devices have been invented to meet the need for visual training away from the rifle range, and the vicinity of the barracks, without involving the necessity for judging distance practice and firing over large stretches of country, for which time and opportunity may be largely wanting.

Among these are the various "landscape" targets and the kinematograph or animated target. The "landscape" targets represent typical stretches of country at home or abroad over which men might have to fight. They are colored to nature and divided into panels; some are arranged so that "silhouette" figures can be moved across them by mechanism worked from the firing point, and with them are supplied faint outlines of each to fix on screens above the landscapes for firing practice. In order to avoid the destruction of the target, aim can be taken at this object, but with the sights elevated, so that the bullets strike the corresponding portion of the outline landscape. For visual training and practice, in recognizing and describing in military terms the features of the ground such as "knoll," "saddle," "crest-line," "angle," "spur," etc., the target is placed at about twenty-five yards from the men, features are pointed out and described, and they lay their rifles on the mark indicated, so that the instructor by glancing along the barrel can see whether they have recognized the target from the description. Field glasses can be used to make out the minor features of the landscape, and to obtain practice in their use.

The moving pictures of the kinematograph are used to form an animated target, infantry appearing and disappearing behind cover, or moving forward to the attack; cavalry and artillery in motion, appear on a thick white paper screen at which the men under instruction can fire either at discretion or under direction of a leader. Behind the screen a brilliant electric illumination shows up each bullet-mark as a sharp point of light, but the men fire under normal conditions, in so far that the firing-point is in daylight. A sound gear mechanism, with sundry electrical connections, causes a short stoppage of the picture each time a rifle is fired, to enable the hit to be seen, then the bullet hole is covered by a screen, shutting off the light, and the target again presents an unbroken surface.

Photographing Under Water

IN the SCIENTIFIC AMERICAN for April 4th, 1908, we published an illustrated description of an apparatus devised by C. Williamson of Norfolk, Va., for carrying on operations under water. The apparatus was designed to take the place of the ordinary diving outfit. Broadly considered, the apparatus consists of three parts: (1) a floating vessel of any suitable design; (2) a submersible terminal operating chamber in which the work is carried on at the bottom of the water, and (3) a collapsible flexible metallic tube connecting the vessel and the terminal operating chamber.

Various types of terminal chambers are used, depending upon the class of work to be carried on; but usually the equipment of a terminal chamber consists of tools operated by compressed air or electricity, and mechanical sleeve extensions with attached mittens, in which a laborer may slip his arms and perform his work. The collapsible tube communicates with the atmosphere, so that the laborer may perform his work under normal atmospheric pressure and therefore much more conveniently than would be possible if he resorted to the usual diver's costume.

This apparatus was recently used in Hampton Roads to make the submarine photographs which appear on the front page of this issue. The tube and work chamber were lowered from a thirty-foot barge through a well six feet square in the bottom of the barge. To take the under water pictures a funnel six feet long with a two-foot six-inch glass port at its large outer end was bolted to the work chamber. Mr. Williamson's son descended into the work chamber with an ordinary camera. A frame containing a reflector and a battery of electric lights, aggregating 1,000 candlepower was then lowered from the deck of the barge so as to light the area around the port. Section after section of the tube was added until the work chamber had reached a depth of thirty feet. Photographs were taken at that depth. The apparatus was then raised to intermediate depths and more exposures made.

Daylight tests were conducted which proved that at depths between ten and fifteen feet photographs of passing fish and objects could be made with exposures varying from 1/10 to 1/75 of a second. The water in Hampton Roads is not very clear, but the experiments showed how much could be accomplished in submarine photography, in the clear waters of tropical regions with an apparatus especially designed for the purpose.

What Are the Ten Greatest Inventions of Our Time, and Why?

A Prize Article Contest Open to All Scientific American Readers

THE November Magazine Number of the SCIENTIFIC AMERICAN is to be devoted in part to a review of the great inventions of our time. Because a large number of SCIENTIFIC AMERICAN readers are either inventors or users of inventions, it seems to the Editors that their judgment of the inventions produced in our time which deserve to be called the greatest, their appraisal of the relative importance of the paramount technical achievements of our day, would be of peculiar value and interest. Therefore, it has been decided to leave the entire subject to them.

The publishers of the SCIENTIFIC AMERICAN offer three prizes of $150, $100 and $50, respectively, for the three best articles on the topic, "What Are the Ten Greatest Inventions of Our Time, and Why?"

Contestants for the prize must observe the following rules:

1. Each article must discuss and answer the following three questions:

a. What, in your estimation, are the ten greatest inventions produced within the last twenty-five years?

b. What are your reasons for this selection? Justify your selection in each case.

c. To what person or persons is the greatest credit due in the developing and perfecting of each invention which you have selected?

2. The entire subject must be covered in a typewritten article not exceeding 2,500 words in length, and must be treated as simply, lucidly and non-technically as possible.

3. In deciding what are the ten greatest inventions of our time, the contestants are limited to machines, devices and discoveries commercially introduced in the last twenty-five years.

4. Since the SCIENTIFIC AMERICAN is "the weekly journal of practical information," and its readers practical business men and inventors, the articles submitted should deal only with *patentable* inventions and discoveries.

5. In order to guide the contestant in deciding what is a great pioneer invention of our time, it is suggested that practical success and general usefulness to mankind be used as a test. A modern discovery may have been suggested long ago and its underlying theory even worked out mathematically, as in the case of wireless telegraphy, but nevertheless it falls within "our time," if it has been made generally accessible and useful within the last twenty-five years. But commercial success should not be the sole criterion. The flying machine has not yet added millions to the national wealth; but, for all that, it is a great invention of our time. Mere improvements on well-known and successful devices are not to be numbered among the great inventions of our time. Because an invention was first patented more than twenty-five years ago it is not necessarily debarred. The date of commercial introduction not the date of the patent governs. The invention, moreover, need not have been actually patented, but its subject matter must be of a patentable nature. Patentability is merely a test of commercial practicability.

6. Contestants must not disclose their identity. Each article must be signed with an assumed name and must be accompanied with a sealed envelope, on which the assumed-name is written, and in which the real name and address of the author is contained.

7. Contestants must address their articles, accompanied by the envelopes containing their real names, to "The Invention Contest Editor of the SCIENTIFIC AMERICAN, 361 Broadway, New York city."

8. The articles will be passed upon by a Board of Judges, whose names will be announced in a future issue of the SCIENTIFIC AMERICAN.

9. The Board of Judges will receive only the articles submitted; the envelopes containing the true names and addresses of the authors will remain in the possession of the Editors of the SCIENTIFIC AMERICAN. When the judges have made their decision, the Editors will open the envelopes of the winning contestants and notify them of their success.

10. The decision of the judges will be announced in the SCIENTIFIC AMERICAN of November 1st, 1913. The prize-winning articles will be published in the order of merit in consecutive issues of the SCIENTIFIC AMERICAN, beginning with the issue of November 1st, 1913.

11. The Editors of the SCIENTIFIC AMERICAN reserve the right to publish in the SCIENTIFIC AMERICAN or the SCIENTIFIC AMERICAN SUPPLEMENT articles which have not been awarded prizes, but which are deemed worthy of honorable mention.

12. While contestants are not required to supply pictures with their articles, illustrations will be welcomed. If drawings are submitted, they need not be elaborate; the staff artists of the SCIENTIFIC AMERICAN will work them up for reproduction, provided the material supplied is intelligible. Do not send pictures torn from books and periodicals; they cannot always be reproduced satisfactorily, and their unauthorized reproduction may constitute a copyright infringement. If photographs marked "copyright" are sent, they should be accompanied with the copyright owner's written permission for their reproduction.

13. Members of the staff of Munn & Company, Incorporated, publishers of the SCIENTIFIC AMERICAN, and of Munn & Company, solicitors of patents, are excluded from the contest.

14. All articles will be received up to 5 P. M., September 1st, 1913.

To Protect Iron Pipe

IRON pipe can be protected from corrosion by heating in a muffle to 1,000 deg. Fahr. and admitting steam at the same temperature. A layer of magnetic oxide of iron is formed. A more satisfactory protection, however, is obtained by Smith's process. The well-cleaned pipe heated to 700 deg. Fahr. is dipped into a mixture of pitch, coal tar and a little linseed oil which has been heated to 300 deg. Fahr. After a few minutes the pipe is drained vertically and cooled. Of course the rapid oxidation of the linseed oil forms a tough binder, as in paint drying. Lead-lined pipe is used for many purposes.

Correspondence

[The editors are not responsible for statements made in the correspondence column. Anonymous communications cannot be considered, but the names of correspondents will be withheld when so desired.]

Schiller's "Bull"

To the Editor of the SCIENTIFIC AMERICAN:

Your correspondent of March 29th, No. 13, mentions a bull made by Schiller and his translator Coleridge; but on looking up the German text of Schiller's "Wallenstein," I notice that the translator alone is responsible for the mistake. The translation should be:

". . . and over there (not therein) is Jupiter."

The German original has it:

"Und dahin steht der Jupiter."

Evidently the translator mistook "dahin" for "darin," "dahin" meaning "in that direction," "over there," while "darin" means "therein." H. LINDEMANN.

Alexandria, Egypt.

Price Cutting and Trust Control

To the Editor of the SCIENTIFIC AMERICAN:

The small dealer cannot afford to cut prices; he must sell his goods at a fair profit. The large dealer who cuts prices on standard goods for which a demand has been created through national advertising, does not do so to sell these particular goods but to attract trade to his store that he may sell other goods at a large profit.

This very thing is favorable to trust control, for by cutting prices the small dealer is gradually frozen out. There are many other reasons why prices should be maintained, but to my mind this is the most important.

BAIRD-NORTH COMPANY,
G. R. HUSSEY, President.

Barb Spikes for Rails

To the Editor of the SCIENTIFIC AMERICAN:

In your issue of June 7th I take interest in your article on "The Screw Spike Versus the Cut Spike." I can readily agree with your argument against the present type of cut spike. In one of your illustrations I notice the position the split wood is forced to take; that is, a downward position from the drive of the spike into the tie.

Now, if the cut spikes had barbs, such as on a fish hook, would not the swelling of the wood by rain or the like tend to make the wood take a position between the barbs and greatly increase the resistance of the said spike?

Now, with the screw spike as you illustrate, could not a wrench of some sort be put on the head of said spike, and the spike be removed by train wreckers or the like? Of course, without the threaded lining in the tie, this would be a much more difficult task.

In my opinion, I think there is need of consideration and debate along that line. THOMAS H. THORN.

Pittsburgh, Pa

Fixed Prices and the Public

To the Editor of the SCIENTIFIC AMERICAN:

In the corset trade any manufacturer who can secure a large volume of business can manufacture at much less cost than if he has but a small volume. We know of no way of getting large volume that compares with the policy of acquiring a national reputation by advertising and by quality for the trade-marked article, and then fixing the retail price of that article so that all retailers who sell it, whether they be large or small, shall be protected in their profits. The fact that the American corset manufacturer is giving the ultimate consumer better values than any other corset manufacturers in the world, speaks for the soundness of this policy—of establishing a trade-mark and maintaining of retail price.

So far as corsets are concerned, there is no question but what the cost of living has been reduced by the rigid system of price maintenance that is enforced by all the leading corset manufacturers in the United States. If prices should not be maintained, the large manufactories would become small, and the values that the women who wear corsets would get for their money would be considerably less.

THE WARNER BROTHERS COMPANY,
Bridgeport, Conn. LUCIEN T. WARNER, Sec'y.

Reversing the Locomotive

To the Editor of the SCIENTIFIC AMERICAN:

I have been reading with much interest the discussion on the various railway automatic stop devices in your very valuable paper. I find, however, in your editorial, "The Need of an Automatic Stop," in issue dated June 21st, that a popular but erroneous opinion is expressed from which you draw a false conclusion.

You infer that the inability to reverse the engine was in part responsible for the collision at Stamford on the New York, New Haven, and Hartford Railroad on June 12th. This is erroneous; although it is believed quite generally and by enginemen themselves who have not learned from experience that to try to stop a locomotive by reversing the engines is utter folly.

It is of course obvious that when once the cohesion between rail and drivers is destroyed there can be no further effect of retardation from the drivers. When the locomotive is pulling a train at even a slow speed over well sanded rails, if the engines are quickly reversed the inevitable result will be to slip the drivers, and this immediately destroys practically all of the cohesion.

In the dynamometer car behind an engine which was pulling a heavy train I have frequently observed the drawbar pull drop practically to zero when the drivers were slipped, the reverse lever not having been touched. I have seen the cohesion drop from 40,000 pounds to zero without the position of throttle lever or reverse lever having been changed. If the reverse lever had been thrown over to reverse position and the engines reversed against the momentum of the train, the result is obvious.

From current newspaper accounts, sensational and no doubt inaccurate, it can be gathered that the engineer in question did succeed in throwing over the reverse lever, which if it be true is merely additional evidence that he was wofully inexperienced. As to providing a more easily operating reversing gear, this has been done for several years on the very heavy locomotives in the form of a pneumatic reverse, which can be operated with less effort than even the throttle, but it is provided for comfort in handling the locomotive, and to advocate it for a safety device is absurd.

The final conclusion that "only a stop which would reverse the power could be of any service when airbrakes prove inoperative at the crucial moment," is based on a false premise, and its application would offer no solution to the problem and would, in fact, be not near as feasible a plan as the various types of automatic stop already proposed, when airbrakes are operative.

Buffalo, N. Y. W. L. HEINZ.

[Reference to this letter will be found on our editorial page.—EDITOR.]

Prices and the Ultimate Consumer

To the Editor of the SCIENTIFIC AMERICAN:

I have just finished reading a copy of the Supreme Court's decision in the case of Bauer & Cie and the Bauer Chemical Company v. James O'Donnell.

In the writer's opinion we should not criticize the court in its decision. It is in no way responsible for the law, and that is where the main difficulty lies. There is a chance for an honest difference of opinion regarding the scope of the word "vending" as incorporated in our patent law. The broad view of this term would lead one to believe that vending of a patented article should be construed to cover the sale of an article or commodity from the manufacturer to the ultimate consumer, regardless of the number of so-called middlemen it passes through.

The courts hold, however, that the vending of the article, insofar as the manufacturer was concerned, ceased when it passed into the hands of the dealer or retailer. The point of difference is that of vending for re-sale and vending for use. Our patent law should be changed so as to clearly cover this point and to bring such a change about. Manufacturers of patent articles handling their commodity through dealers and retailers should bring forcibly to the attention of our legislative bodies the danger to manufacturing concerns if the law is allowed to stand as at present interpreted. Stockholders and employees of such concerns should not overlook the fact that their interests are at stake, and should join with the manufacturers to bring about changes in our patent law to conform to the modern methods of merchandising.

Unfortunately, our legislatures are made up largely of men of little business experience, and their judgment in such matters is based upon theory rather than practice. These men are no doubt prompted by lofty motives in their attempt to protect the "common people" of our country against the so-called monopolies. They unfortunately pick out a few glaring examples of abuses practised by concerns built on patent rights, and use these as criterions in their effort to regulate business of this nature. Their main aim, of course, is to protect the weak against the strong; they, however, in striving to accomplish this end, are weakening the strong rather than strengthening the weak; in other words, they are using destructive instead of constructive methods in their attempted solution of this problem.

In the case in question, to wit, the taking away from the manufacturer the ability to establish the re-sale price of his product will work not only great injury to the manufacturer, who has spent large sums of money in bringing before the public the merits of his goods, but will effect in the writer's opinion a result diametrically opposite to that intended insofar as the small retailer and ultimate consumer are concerned.

This same point is covered in one section of the proposed Oldfield bill, now pending before the House, which if passed will create a chaotic condition in the business world where commodities are handled through dealers or retailers. When our original patent law was framed, it was not necessary to cover this point in question, as there was little heard of the middleman in those days, the sales being largely made directly from manufacturer to consumer, and this difficulty manifests itself in many of our laws in relation to business to-day; in other words, our laws have not kept pace with the changing methods of doing business. This fact has made it necessary for our courts, in interpreting a law as it pertains to present-day business, to read into them words or phrases, thereby adapting them to modern conditions, but in so doing have assumed the roll of lawmakers rather than acting in a judicial capacity as intended. In reading into the Sherman Anti-Trust law the word "reasonable," as applied to restraint of trade, illustrates this point.

The writer's contention is the vending of a commodity does not stop with the sale from manufacturer to agent or dealer, but is still in the vending stage until the ultimate consumer takes possession, and, therefore, the manufacturer should have control of the commodity price to the ultimate consumer, regardless of the number of middlemen it passes through.

Another way of looking at the same point is that our patent law to-day gives exclusiveness to the inventor in making, using and selling his invention. It does not compel him to do any of these, therefore, why should he not have the right to sell his patented article under any conditions he sees fit? One of these conditions being to maintain the re-sale price. The effect of this decision will not only be felt by the manufacturer, who, by the way, through differential discounts and other means at his command, can more or less control the re-sale price of his commodity, but will drive out of business the retail dealer, who cannot stand the price cutting which large department stores and mail-order houses could practise in certain lines of goods for the purpose of creating in the minds of the buying public that all of their prices are proportionately low; in other words, using certain well-known lines as leaders and making their profit on lines of goods whose established selling price is not known.

As to the ultimate consumer, he now has the assurance, through the vast amount of publicity given to standard lines of commodities, that he can purchase these goods at the same price from a small dealer as from a mail-order house or large department store. Rather than make it prohibitive for the manufacturer who sells his goods through dealers controlling the re-sale price, the small retailer and consumer would be more greatly benefitted by the law compelling manufacturers and retailers to establish and maintain the same re-sale prices throughout the United States, leaving to their discretion as to what this price should be. If they make this price excessive, their goods will not sell; if they make this price too low, they cannot stay in business. This would insure the ultimate consumer being able to buy a standard article at a standard price at any point in the United States, and make it impossible for large corporations to drive the local competitors out of business through their ability to cut prices in certain localities, while maintaining standard or excessive prices in localities where no competition is present.

This very use of price cutting has enabled some of our largest corporations to attain their growth and maintain their monopolistic hold on their commodity, which would have been impossible had they been compelled to maintain a standard price throughout the country. Their ability to change their prices as often as necessity requires should not be withdrawn, provided the price-change effects all localities at the same time.

One point which is apparently lost sight of by our legislators in the present wave of reform to protect the ultimate consumer is the fact that the consumer must produce to be able to consume. Those that produce more than they consume are making profit and progress; those that consume more than they produce are on the road to bankruptcy. If our law-making bodies would exhibit the same interest in promoting the production end of our peoples' welfare that they now show in the consumption end, a great many of our business ills of to-day would be remedied and the big and little consumers would have the wherewithal to meet the rising cost of living conditions so prominent in our national life to-day.

THE AMERICAN MULTIGRAPH COMPANY,
Cleveland, Ohio. H. C. OSBORN, President

Some Novel Uses of Compressed Air

How Compressed Air is Used for Sheep Shearing, Cutting Sugar Cane, and Shifting Automobile Gears

Air is a harmless, elastic fluid, non-combustible, healthy; and is the most widely distributed of all substances. We simply compress it and hold it in a condition of confinement. We must merely provide a vessel strong enough to overcome its elasticity. With air, when once a vent occurs, the pressure falls very rapidly and the strain is soon relieved.

Riveting with Compressed Air.

The hammer drill, used in riveting, chipping, chiseling and miscellaneous machine shop work, is one of the most important applications of compressed air. Economy in the use of air is a feature of this tool. Small machines use from 25 to 30 cubic feet of free air per minute, the larger 35 to 55 cubic feet per minute, and air at a pressure of 80 or 90 pounds — sometimes 100 pounds—is generally recommended.

It is expensive to lay pipe and rivet up the joints in the ordinary manner. Holes, for passing the hot rivets into the pipe, must first be provided; and the rivets have to be pushed up from the inside through the holes, the workmen holding the rivets against the blows from the outside. During all this operation, light rivets are becoming cold; and the difficulty and annoyances and hard work during the whole task, make it expensive and the results inferior to riveting with compressed air.

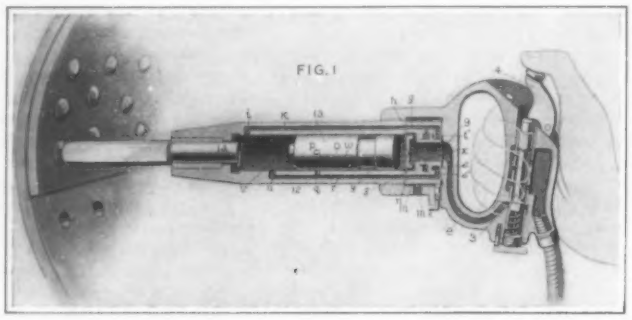
When using pneumatic tools for this work, the rivets can be pushed in from the outside, the workman, on the inside of the pipe, using the tool to rivet it up on the inside. The workman inside is thus furnished with good air to breathe and merely has to handle a light tool.

Pneumatic hammers have been a great help to boiler makers. In actual test, an operator with a pneumatic tool cut off a two and a half inch tube in thirty-six seconds as against two and a half minutes by hand; and forty-six tubes were cut off, turned over and beaded with the same tool in an hour and three quarters as against five hours doing the same work by hand.

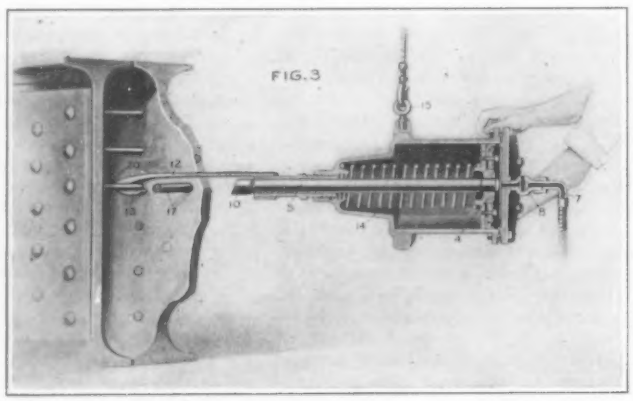
Horizontal boiler seams may be calked and trimmed in one third the time required by hand labor.

With a pneumatic drill holes up to seven eighths inch in diameter can be made, and will drill such holes through a web of a rail one half an inch thick in less than one half a minute. Eighty to one hundred rivets per hour have been driven in field work, erecting large water, gas and oil tanks. The length of stroke of the striking piston is usually four inches and about eighteen hundred blows per minute are struck.

Fig. 1 shows such a tool. Air is admitted to the passage *e* by operating the lever 4 to open the throttle valve 3. When the valve 9 and hammer 13 are in the position shown, the ports *g* are open, and permit the air to pass into the cylinder 12 through the port *h*, to drive the hammer until it strikes the tool 14. Just before the hammer reaches its extreme forward position, the groove *y* opens communication between the ports *p* and *q*, whereupon the air passes through *n*, passage *o* and port *p*, through *q* and *r* to *s'* and *s* and acts on the valve 9, driving it to the extreme left. This closes the ports *g* and *h* and opens the exhaust port *m*; and the fluid exhausts to the atmosphere through m^x. The air now flows through *t'*, *k* and *i* and moves the hammer back until *u* is open. This relieves the pressure on the valve 9, as *v* is open; and the air is exhausted through *s*, *s'*, *r*, *u*, *v*, *w*, *x* and m^x to the atmosphere. This drives the valve back, due to the pressure always acting on the valve, and the operation is repeated.



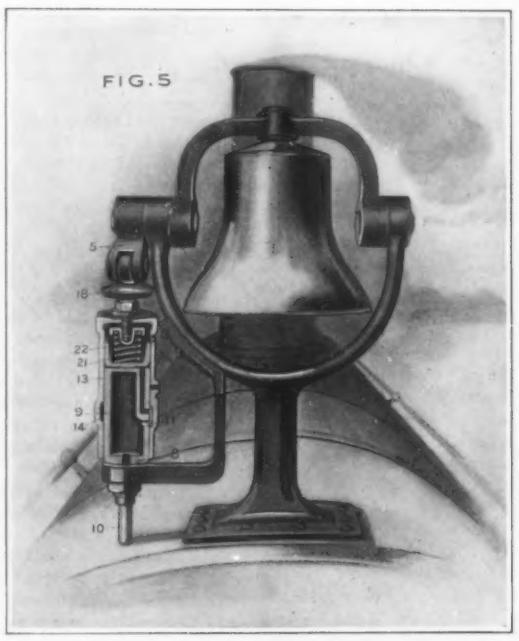
With a pneumatic drill holes can be pierced easily. Eighty to one hundred rivets have been driven in an hour.



Cutting the staybolts of locomotive boilers with compressed air.

A compressed air rammer for heavy work in foundries.

A compressed air sheep shearing apparatus.



A pneumatic bell-ringer for locomotive.

Ringing a Bell With Air.

It has been shown that on a locomotive, equipped with a compressed air bell-ringer, the saving in consumption of fuel in one month has been enough to pay for the device. The explanation of this is, that the fireman has so much more time to attend to the firing of the boiler, instead of looking out of the window and watching for crossings to ring the bell. Such a device is shown in Fig. 5.

The bell ringer is attached by a bracket to the yoke of the bell; and consists of a stationary portion S, upon which the cylinder 13 reciprocates. Air is introduced at 10, enters the chamber 9 and passes thence through the port 11 into the annular groove 14, thence between the spring-pressed plug 22 and the top of the piston. The cylinder is then moved vertically, which causes the disk 18 to operate the crank arm 5 to swing the bell. As soon as the groove 14 passes the port 11 the air is exhausted and the spring 21 returns the cylinder to its initial position.

Shearing Sheep With Compressed Air.

Many attempts have been made to perfect a mechanism to lighten the work for the shearer, prevent the wool from being injured by second cuts and guarantee the fleece to be even in length.

A very satisfactory device, operated by compressed air, is shown in Fig. 4.

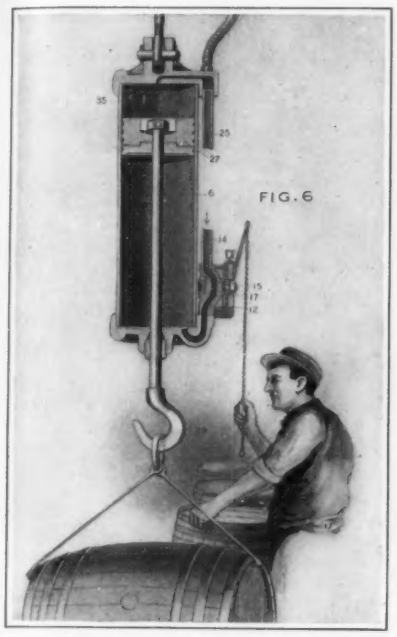
Air enters at *c*, passes through either port *i* or *i'*, controlled by the air operated valve *V*, to the respective ends of the cylinder, which causes the piston *P* to be reciprocated, the air being exhausted through the ports *c* and *p* to the atmosphere. The reciprocation of the piston *P* causes the lever *L*, forked at one end, to engage with the roller *h*, mounted on a pin on the piston, to oscillate on its fulcrum *f* and thus operate the blades *B* of the shears.

A device of this character reduces the time of shearing from an average of seventy sheep by hand to about one hundred per day of ten hours; or in other words, one machine can accomplish in one day as much work as it formerly took three men to turn out. Animals are never mutilated, and the wool brings a better price on the market on account of the length of its fibers.

An Air-driven Butcher's Cleaver.

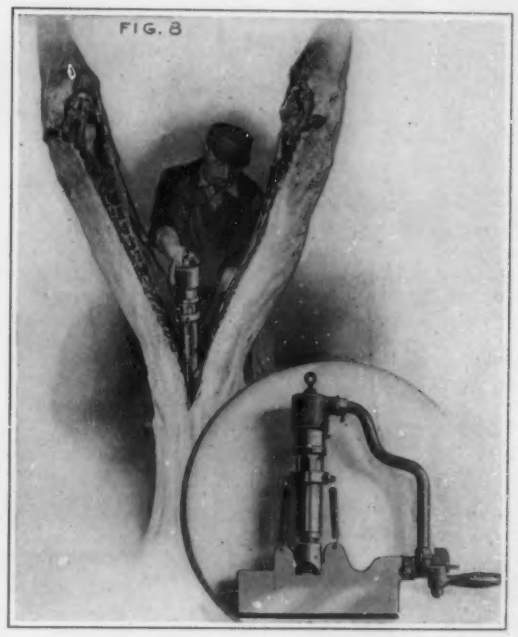
A compressed air operated butcher's cleaver is shown in Fig. 8.

This device is used for halving animal carcasses by dividing along the center of the spinal vertebræ.



The air hoist for lifting heavy weights.

Cutting sugar cane with compressed air.



A butcher's cleaver that is actuated by compressed air.

In the operation of the cleaver, the workman grasps one handle with one hand and another with the other on the vertical portion of a pipe. The flow of air from a flexible supply pipe is controlled by a valve lever. The operation of the hammer may be regulated as desired. The cutter blade is driven through any bones or tissue with which it may be placed in contact. The workman has only to guide the blade in order to make the desired cut rapidly and effectively.

A Pneumatic Sugar Cane Cutter.

In cutting sugar cane prior to crushing, it is essential that the cane be cut level with or slightly below the level of the ground in order to prevent waste and to ensure a good crop the following year. It has been the practice to cut the cane with a cane knife, wielded by hand. As the stalks are usually from three quarters of an inch to two inches thick, the labor is, to say the least, very arduous, since the operator is constantly stooping and must cut the stalks more or less at an angle, whereby considerable waste occurs, as well as loss of time.

A compressed air sugar cane cutter is shown in Fig. 7. The device is strapped to the forearm of the workman as shown, the latter grasping the handle 29. Air is admitted at 4, below the handle 29, to the passages 5, 6, and 7 to the port 8, where it enters the chamber 9, formed by the grooved part 12 of the differential piston 13. From this point the air passes through the port 15, the passage 16 and the port 17 into the chamber 18. The chamber 20 being open to the exhaust 21 through the port 22, the air acting on the shoulder 23, will force the piston to the right of the cylinder. As soon as the head 11 uncovers the port 24, the air passes through this port, through the passage 25 and port 26 into the chamber 20, causing the piston to move to the left, the exhaust taking place from the chamber 18, through the port 27, passage 21, chamber 28 and outlet 30. This causes a blow to be struck on the tool 39 and the sugar cane stalks to be instantly severed.

In this way the sugar cane can be cut practically as fast as a man can walk, and there is no waste. The exhaust outlet 30 is so located that the operator is kept cool, which is of importance, since the plantations are in tropical climates.

Cutting Stay Bolts With Compressed Air.

The stay bolt cutter, operated by compressed air, is one of the handiest tools in the boiler shop, as the shearing off of stay bolts is tedious work when done by hand. Such a device is shown in Fig. 3.

The tool is suspended by a flexible connection attached to the eyebolt 15, so that the piston rod 5 shall be in the plane of the stay bolt 17, and the hook 13 of the connecting bar 12 is hooked upon the stay bolt 20. Air is admitted at 7, through the valve 8 and the piston 4 causes the tool 10 to sever the bolt 17. The valve 8 is then turned to exhaust the air, and the spring 14 returns the piston to its initial position.

Stays in the firebox of a boiler have been cut off in three hours by such a tool, handled by two boys; a job which would require a boiler maker and helper nearly two days—a saving in cost of about 90 per cent.

Compressed Air Rammers.

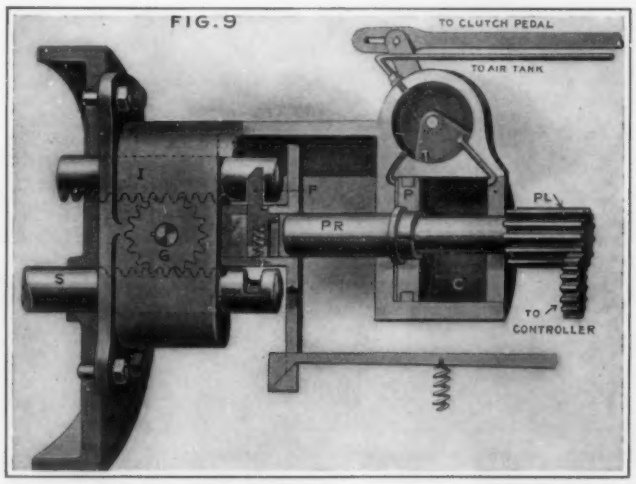
Compressed air rammers for heavy work in foundries are simple in construction and accomplish an enormous amount of work. Fig. 2 shows a tool for ramming up green sand cores and molds of large surface area and depth.

The tool depicted is suspended by the loop *L;* but much smaller single cylinder rammers are often used, capable of being carried around by hand.

In the present instance, the mold is placed beneath the tool, and air is admitted from the hose *V* by the valve *G*, which permits the air to pass alternately to the cylinders *A* and *A'*. As the piston *C* rises, the air is exhausted at *D;* and when the end of the stroke is reached, the trip *I* operates the valve *G* to cut off the air from *A*, and introduces it in *A'*, causing the piston *C'* to descend and thus strike a blow with the rammer *E*, the air being exhausted at *D'*.

The workman stands in the mold and directs the blows by the handles *S*. Oil is sprayed into the cylinders by the oiler *J* and the compressed air.

By the use of these machines, one man can readily do the work of from eight to twelve men. The rammers use air at a pressure of about eighty pounds per square inch and strike from two hundred and fifty to three hundred blows per minute.



Shifting the gears of an automobile with compressed air.

The Air Hoist.

The application of air hoists to cranes, planers and, in fact, to all conditions in which a hoist may be useful, is now made in an almost endless variety of ways to meet the requirements of machine shop and foundry practice. The hoist is hooked to a tackle for adjusting the height and the work is quickly done.

In Fig. 6 the valve lever 17, which is usually provided with a chain, is used to operate the three-way valve 15 to admit the air from the pipe 14 to the cylinder 6, on the under side of the piston 27. This raises the piston and the load attached to the hook 29. When it is desired to lower the weight, the valve 15 is turned to open the port 12 to the exhaust and admit air through the pipe 25, which is connected to the valve casing, at the top of the piston. The ports 35 are leak ports to prevent the formation of a vacuum, in case it is desired to drop the piston by its own weight.

Few realize how cheap it is to operate an air hoist, aside from its convenience and speed in handling loads. It has been estimated that compressed air at 90 pounds pressure costs about five cents per 1,000 cubic feet of free air or 143 cubic feet of capacity in the air lift; and with air pressure of 75 pounds per square inch a cylinder 5 inches in diameter, a weight of a half a ton can be lifted or lowered four or five feet.

Combined Pneumatic Gear Shifter and Engine Starter.

With the automobile starting crank securely tucked away in the tool box along with other implements that seldom are used, it was quite logical to expect that the gear shifting lever too soon would be relegated to a place of comparative obscurity; and it is not the least bit surprising, therefore, that several devices, designed to lighten the burden of the driver by substituting mechanical for manual control of the transmission gears, have appeared of late.

Ever since the beginning of the automobile, compressed air has proved a fertile field for the inventor—history has it that as long ago as 1800 an Englishman invented and patented a complete compressed air automobile; but except for the pneumatic engine starter compressed air devices never have amounted to much up to the present time. Now, however, there has been developed a new pneumatic system which would seem to hold forth real promise, for the reason that in it complication has been reduced to the minimum. Not only does the system furnish compressed air for inflating tires and for starting the engine, but it also provides means for shifting the transmission gears and the effort required by the driver is no more than is required to advance the spark or to open the throttle. With this system, the operation of shifting gears has been reduced to a simple depression of the clutch pedal.

The principal unit in the system is the air compressor, of course—a tiny little four-cylinder machine with cylinders measuring two by two that serves also on occasions as the motor to start the gasoline engine. The compressor is geared to the crankshaft of the engine and is quite automatic in action. When the pressure in the reservoir drops below 200 pounds, a pneumatic valve automatically connects the compressor and refills the tank; when the pressure reaches 250 pounds the compressor is disconnected. The valves of the compressor are so arranged that when a lever on the dash is pulled, the unit becomes an air motor. When running as a compressor, the gear ratio with the gasoline engine is 2 to 1, but when operating as a starter the ratio automatically is changed to 1 to 4.

In eliminating the ordinary hand gear shifting lever, the system merely substitutes for it a piston working in a cylinder, and a selector mechanism operated through a small steering column indicator; the operation of the device is best made plain by reference to Fig. 9. The shifter rods of the gearset are designated

(Concluded on page 21.)

Fuel Production in the United States

Present Consumption and Future Supply

By R. H. Byrd

THE United States has become habitually a half billion ton coal country and at the same time a quarter billion barrel oil country. In 1910 the production of coal for the first time exceeded the 500,000,000 ton mark, and in 1911, according to the official returns of the United States Geological Survey, it was short of that figure by only 1 per cent. The increase in the production of coal during the past decade has been most spectacular. It was thought that in 1900 a high-water mark had certainly been reached with a production of 269,684,027 short tons, yet the production of the past two years has been nearly double, or 231,912,351 and 226,504,281 tons greater, respectively. Judging from the past there is no good reason to suppose that the increase in production will not continue; and it will certainly be a year of poor industrial progress where the output falls far below the half billion ton mark. Indeed a study of the mine figures for 1911 shows that but for the depression in the iron trade in that year, in which coal largely figures, the coal production would have established a new record, well in advance of 500,000,000 tons. The estimated production for 1912 is about 540,000,000 short tons.

In 1911, Pennsylvania as usual led all States in coal production, with a total of 235,185,370 short tons, 144,721,303 tons being bituminous and 90,464,067 tons being anthracite. This is a vast production for a single State. It is almost as much as the combined production of all the other twenty-seven coal-producing States. Pennsylvania has a greater production than any foreign country except England, and the output of a number of her individual counties is greater than that of some countries which are classed as important coal producers.

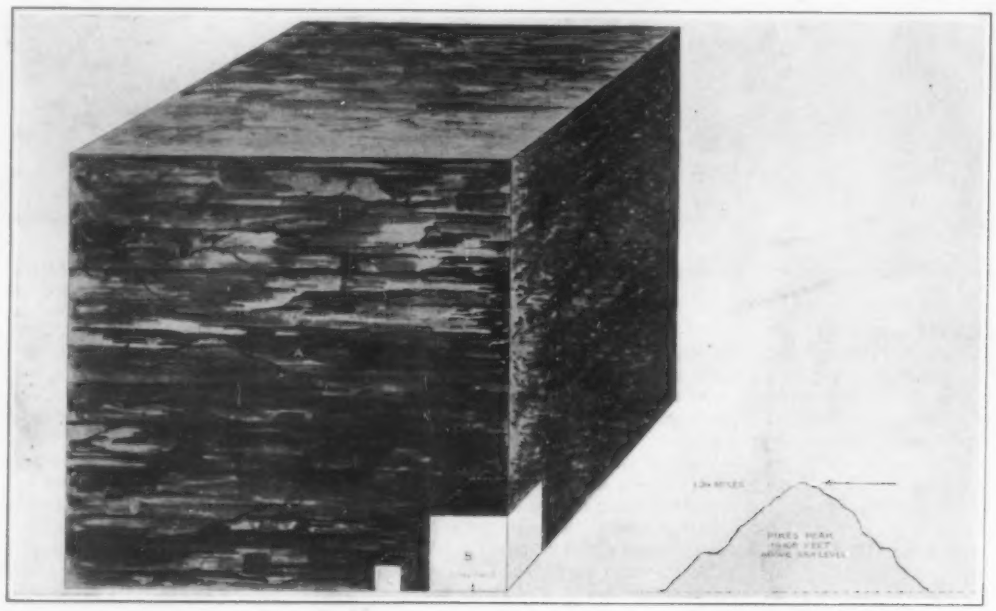
The second greatest producing State was West Virginia, which mined 59,831,580 tons; the third coal State was Illinois with an output in 1911 of 53,679,118 tons; the fourth was Ohio with 30,759,986 tons; the fifth was Alabama with 15,021,421 tons. Indiana, Kentucky, and Colorado, each produced over 10,000,000 tons.

Fully as spectacular as coal is the production of petroleum, which has now attained a highly important position as a fuel and a commodity, and in many localities is successfully competing with coal. The following table shows the enormously rapid growth of the petroleum industry since 1900.

Year.	Barrels.
1900	63,620,529
1903	100,461,337
1907	166,095,335
1910	209,557,248
1911	220,449,391

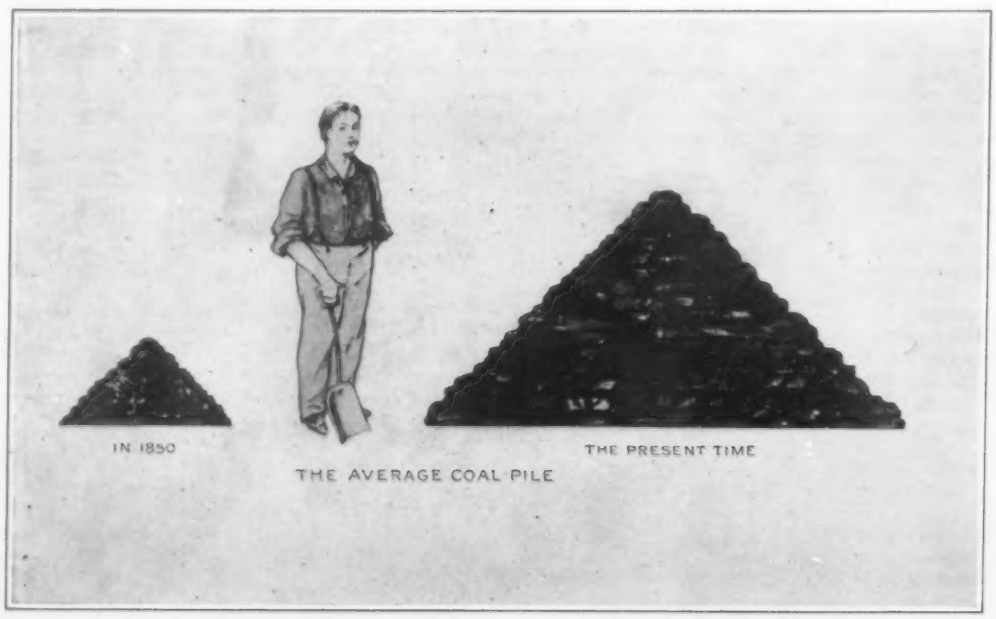
This output for 1911 was 63 1/3 per cent of the total production of the world, despite the fact that the world's production surpassed all former records.

The value of the total production of coal in 1911 was $625,910,113, of which $174,952,415 is to be credited to the Pennsylvania anthracite production. The average price for bituminous coal was one cent lower in 1911 than in 1910—$1.11 against $1.12—and that of anthracite was three cents higher—$1.93 against $1.90—per short ton. The total value of the oil output for 1911 was $134,044,752, an increase of $6,148,414 over 1910.



Amount of coal mined and unmined in the United States.

A.	Estimated original coal reserve of the United States (in the ground)	3,554,383,400,000 short tons
B.	Total exhaustion of coal in the United States to date (close of 1911)	14,181,980,000 short tons
C.	Annual production 1911	496,221,168 short tons

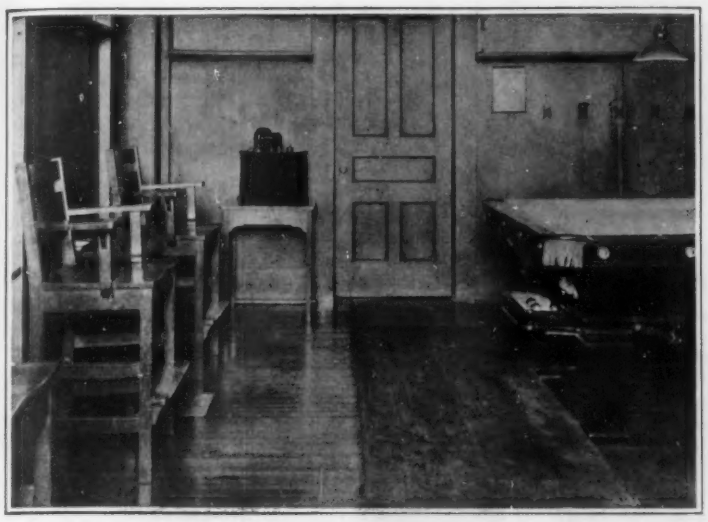


A comparative showing of increase in the consumption of coal (United States).

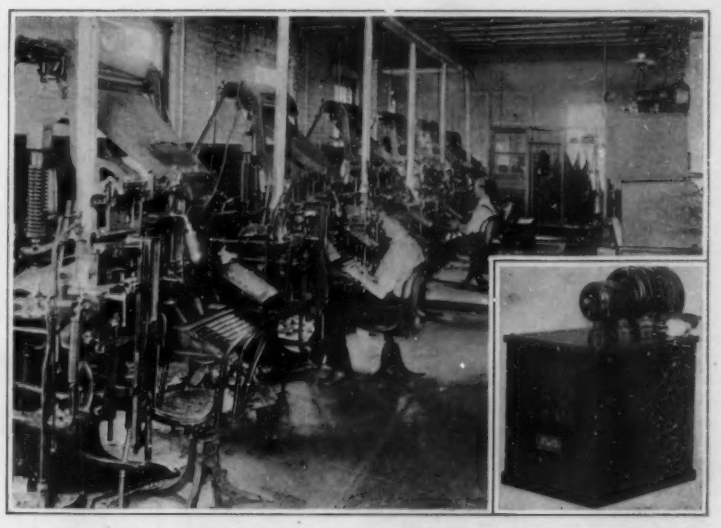
The analysis of the prices of both coal and oil in the various fields affords some interesting study. In West Virginia, for instance, which for the last three years has stood second in rank among the coal producing States, the situation is unique in the low price which its excellent coal brings to the producer. The trouble is that the State has no well developed local markets and more than three quarters of her coal is shipped to distant ones, in other States. West Virginia in her remarkable coal deposits has a source of vast potential wealth in what it might create in the State were it used to develop home industries. Illinois affords a striking example of what West Virginia might accomplish. Illinois is the third producing coal State and in former years has had second place. In 1911 she produced the greater amount of 59,831,580 tons, but it was valued at only $53,670,515, the figures being practically reversed. The average price of the incomparable West Virginia coal at the mines was 90 cents a ton, while that of the much inferior Illinois coal was $1.11 a ton. Some West Virginia coal is shipped to Chicago. The reason for this is that West Virginia is not a manufacturing State, but that Illinois is one of the most important. Her manufacturing industries have been developed and maintained by means of her great coal resources. These industries on their part furnish local markets for the coal and enable the producers to get much higher prices than those which the West Virginia operators get for their far superior grades of coal which they must ship hundreds and even thousands of miles from the mines. Comparisons between West Virginia and Alabama are still more striking. In its important iron industry Alabama has a local outlet for most of its coal. During the last eight years the average price has ranged from $1.19 to $1.36 a ton, more than 30 per cent better than West Virginia prices. In its high-grade cheaply mined, low-priced fuel, West Virginia offers advantages to the development of manufactures that should place it among the leading manufacturing States. As a matter of fact, it stands twenty-ninth.

With our coal and oil production increasing as it is by leaps and bounds, the question is often discussed: How about the ultimate supply? When will exhaustion come? Undoubtedly the oil supply will go first. The petroleum reserve cannot be closely estimated, like coal deposits; but all estimates place the supply as running up into many billions of barrels so that compiete exhaustion of even this fuel is a long way off; but when a few desultory facts regarding coal are considered, which may be mentioned at random, it can be seen that a genuine "coal pinch" for the American nation is a far distant contingency. For instance, bearing in mind that the total amount of coal mined and wasted in mining up to the present time is approximately sixteen billion tons, consider the news item recently given out by the Geological Survey estimating the tonnage of the Bull Mountain coal field in Montana. The tonnage of this single, little known, field is placed at five billion tons. Again, a newly discovered field in New Mexico—the Black Mesa field—is conservatively estimated, because of meager data, to contain twelve billion tons. Again, whereas a few years since 60 per cent of the coal in a workable bed was lost in getting out the other 40 per cent, to-day the average is reversed and 60 per cent is saved. Another thing to consider: the five hundred billion tons of lignite estimated to

(Concluded on page 21.)



An ozonator installed in a club house for use in thoroughly sterilizing the atmosphere of crowded rooms.



Installation of an ozonator in a large composing room. In the insert an alternating current ozonator is shown.

Ozone as an Aid to Good Health

MOST people are fully aware that oxygen is the one element which is absolutely essential to the existence of animal life, but few, however, are aware of one of the most important functions performed by this element, and that is, its purifying properties. Decaying vegetable and animal matter throw off poisonous and offensive gases which tend to make the air dangerous and unfit for breathing purposes. These gases are not only offensive to the sense of smell, but are often dangerous to the individual breathing them. Should these gases accumulate unchecked, the air which we breathe would soon become incapable of supporting life.

Practically all organic matter, however, will combine with oxygen to form inoffensive and harmless compounds, chiefly carbon dioxide and water. In nature, this oxidation is generally slow and is inadequate where the population is congested, as in cities, and recourse must be had to the various chemical disinfectants now on the market, but these are usually objectionable. While they destroy the disease germs, the disinfectants themselves give the air a disagreeable and offensive odor. Hence, more and more attention is being paid to an allotropic form of oxygen known as ozone—a form not only capable of sterilizing air and liquids, but of deodorizing them as well without leaving a residue. While this gas was discovered many years ago, it did not come into practical use until in recent years. It is usually generated by passing a silent discharge of electricity of high potential through a current of air. There are, of course, many other methods but they are confined to laboratory use. In nature, it is generated in the air during thunder storms and also by the ultra-violet rays of sunlight. Its presence can be detected by the peculiar pungent odor in the air especially after thunder storms. Part of this, however, is probably due to hydrogen peroxide which has properties closely analogous to those of ozone and which is generated in much the same way.

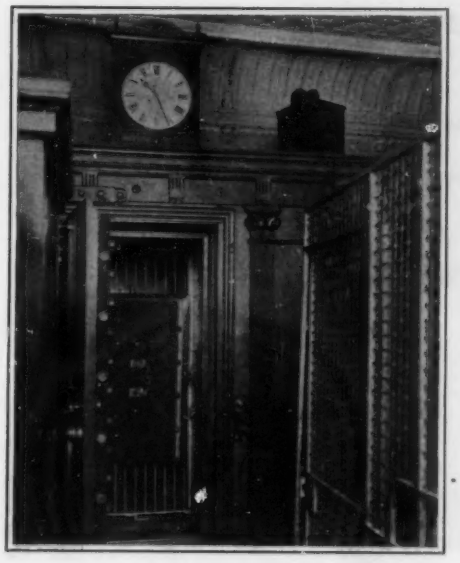
Ordinary oxygen gas is made up of molecules which consist of three atoms. All conditions being the same, a quantity of oxygen converted into ozone would have only two thirds the volume of the oxygen. Ozone is comparatively unstable and readily breaks down into ordinary oxygen. To this peculiarity its great disinfecting power is due. It is well known that elements, at the instant they are released from the molecule in which they were previously united, have a vastly greater combining power than when they are in the quiescent condition. This, in chemistry, is known as the "nascent state." Ordinarily, chlorine will not attack gold or platinum, but at the instant it is liberated from muriatic acid, it will combine with both these elements. Ozone, in breaking down, throws off oxygen in the nascent state, which readily combines with most substances of animal or vegetable origin and oxidizes nearly all the metals, besides producing a variety of other changes, which are not produced by oxygen at ordinary temperatures.

Of the many uses made of ozone, it is probable that ventilation offers the most promising field. In factories, hospitals, assembly halls, etc., where crowded conditions exist, it is possible to keep the air perfectly deodorized and disinfected by using ozone. The foul air often found in such places undoubtedly lowers the vitality and the efficiency of those who must live in such an atmosphere, while the danger from infection is great. By reason of the great avidity shown by ozone for all organic matter, all offensive gases are promptly reduced to inoffensive and harmless forms. Furthermore, it has been definitely proven that if the air contains at least six hundredths of one per cent of ozone, it is thoroughly sterilized.

It is well known that persons breathing the foul air in crowded rooms and buildings are very prone to contract lung and throat troubles. This could be easily avoided by a judicious use of ozone. However, there is danger in using too great a percentage of ozone, for it will cause inflammation of the mucous membrane of the respiratory organs. Since the disinfectant leaves no residue, it is especially valuable in disinfecting and ventilating operating rooms, and in ventilating wine cellars and breweries. Being very unstable, the gas must be generated at the point of use, but wherever an electric fan is installed, an ozone generator may be added without greatly increasing the cost.

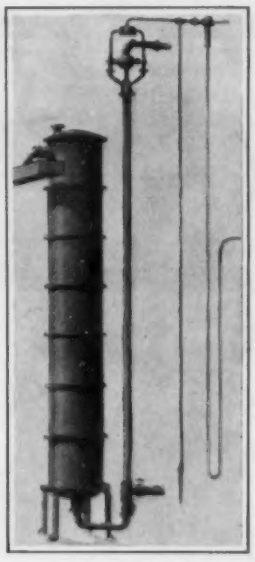
The purification of the water supply for cities by the ozone process has met with much success, especially in Europe. In this method it is essential that the water be fairly free of solid matter, the best results being obtained when the fluid is first filtered. The water and ozone are generally thoroughly mixed by means of an injecting nozzle or the gas is injected at the bottom of a tank while the water enters at the top. In this way, the ascending ozone becomes thoroughly mixed with the descending liquid. Many tests have been made of water so treated, and in no case have any dangerous bacteria been left alive, while discolored and bad tasting water is rendered clear, sparkling and appetizing. A purification process which converts an unwholesome stream into a liquid as inoffensive as the purest spring water is one that must appeal to all.

In the preparation of ozone, a high voltage in the ozonizer gives the best results. If the gas is made by treating air, the air should be dry, for otherwise considerable hydrogen peroxide will be produced, and, while this substance is an excellent disinfectant, in treating water it is likely to remain as an objectionable residue. The temperature must also be kept down; for at 270 deg. Cent. it decomposes wholly. At ordinary temperatures, it is practically impossible to turn all oxygen into ozone.



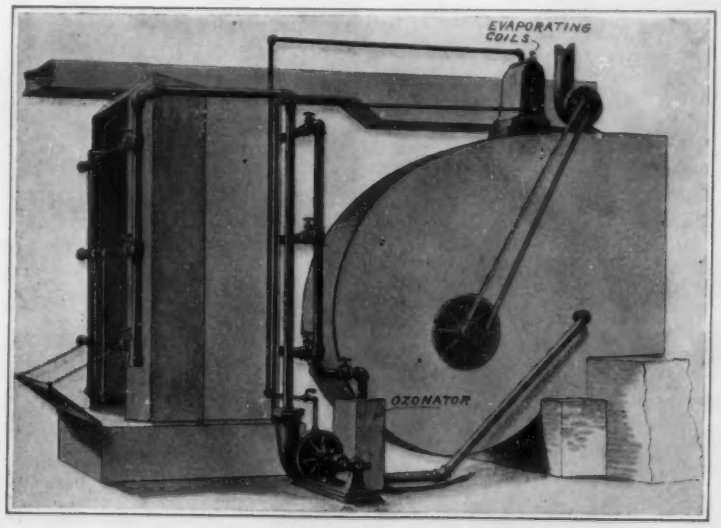
An ozonator in position in a trust company's vault.

Ozonators are made in a number of different sizes, for the household, for general purposes, for the factory, and so forth. A special small type is also made for use in out-of-the-way places, such as basements, kitchens, etc., where appearance is a secondary consideration. In houses provided with a furnace circulating hot air, an ozonator may be placed in the cold air duct, so as to circulate ozone throughout the house. An industrial type of ozonator is also made, which supplies ozone in high concentrations, not for ventilating purposes, but for use in various chemical and other processes depending on the use of ozone. Ozone in liquid form is somewhat dangerous to handle if there are any organic substances near with which the vapors may come in contact.



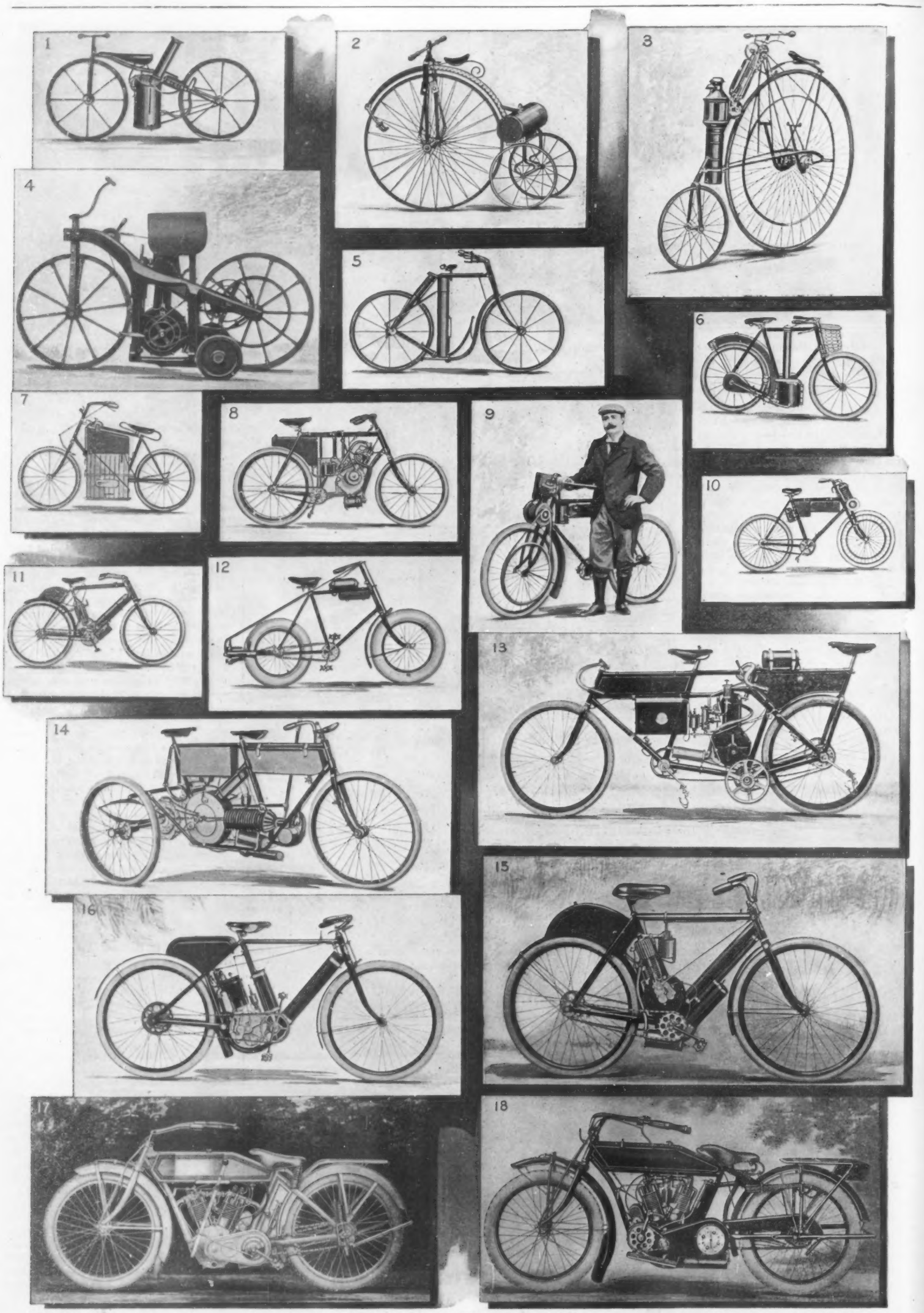
In this Twombly ozonizer for sterilizing liquids a sterilizing tower is provided with perforated diaphragms.

Adjacent to the inlet of the tower is a spreader which diffuses equally throughout the bottom of the tower the entering liquid and the ozonized air. A velocity pipe extends from above the tower. There is also an ozone supply pipe and injectors between the ozone supply pipe and the velocity pipe.



The Donaldson ozonizer.

After the air has been washed, cleansed, and cooled, it is charged with ozone by an "ozonator." A pipe is connected to the casing of the fan so that a small quantity of air may be blown, by the operation of the fan, into the ozonator. The air passing through the pipes and the ozonator becomes charged with ozone and is delivered through a series of distributing nozzles that project the ozone-laden air within the path of the cleansed humidified air as it emerges from the eliminator.



1. Austin steam velocipede, 1868. 2. "Highflyer," 1876. 3. Copeland steam machine, 1884. 4. Daimler's motorcycle, 1885. 5. Twombly's machine, 1895. 6. Volta's steamer, 1895. 7. Roper's machine, 1896. 8. First American motorcycle. 9 and 10. Werner and his pioneer bicycle, 1898. 11. Hafelfinger's model. 12. The Pennington motor-wheel. 13. Motor tandem of 1900. 14. Horizontal motor tandem of 1902. 15 and 16. Standard machine of 1902. 17 and 18. Standard motorcycles of 1913.

Genealogy of the motorcycle.

The Genealogy of the Motorcycle

From the Steam Velocipede, 1868, to the Standard Machine of 1913

By J. J. O'Connor

IF man were not eternally seeking "the easiest way" of doing things, motorcycles still would be things of the future. His physical limitations forever are spurring him on to devise new and less laborious methods of doing things. Hardly had the bicycle been conceived, than the human effort essential to its propulsion presented distasteful visions of real work, and man began to seek a pair of mechanical legs that never would tire, regardless of hills and roads, and that would be far fleeter than the common variety of flesh and bone.

Hence the inventors' dreams of the motorcycle. As early as 1868, bicyclists, or velocipedists, as they then were designated, felt the necessity for something that would help them up hill and against the wind, and in that year, W. W. Austin of Winthrop, Mass., who was one of the most ardent seekers for mechanical propulsion, contrived and attached a coal burning steam engine to his velocipede. The piston rods were directly connected to cranks on the rear wheel, and the boiler was hung amidships and directly back of the saddle. This vehicle, which naturally had a very limited steaming radius, is, in the absence of other convincing proof, generally accepted as the original embodiment of the motorcycle—the forerunner and "daddy" of the now large and increasing family.

If anyone abroad made an effort to produce a steam bicycle the fact yet remains undiscovered. The nearest approach to anything of the sort was a three-wheeled machine described in those days as a "velociped tricycle." This curious vehicle was illustrated and described in an English newspaper in 1876. The "Highflyer," as it was named, was equipped with two small engines, "fitted by means of a suitable arrangement" to the interior of the front fork. Over the rear wheels was supported a "little copper boiler and petroleum furnace." It is inferred that the steam was carried from the boiler to the little engines through the frame of the machine and regulated by a turn-cock placed conveniently to the operator. The driving rods communicated with the cranks on the main axle. As the illustration shows, the "Highflyer" had one large driving wheel in front, and two small balance wheels in the rear. The origin and detailed history of the machine, however, are buried in oblivion.

In contradistinction to this rather fanciful conception, Austin's steam velocipede of 1868 is yet carefully preserved, and has been publicly exhibited in the last decade. While the Austin creation was crude and ungainly, and afflicted with painfully narrow limitations, despite its apparent instability, its builder solemnly affirmed that he had ridden it the tremendous distance of over 2,000 miles. Whether the extreme proximity of the boiler and smokestack to the rider's anatomy seriously diluted his enjoyment of his weird hobby, the historian sayeth not.

For a time, and in fact, until the comparatively recent discovery of the Austin machine, what was considered to be the original American motorcycle was the steam machine devised in 1884 by L. D. and W. E. Copeland, two California experimenters. The engine and boiler formed a compact and ingenious invention, and inclusive of the driving pulley, weighed but 16 ounces. This undoubtedly was the first application of the belt drive to a motorcycle.

In a description of this machine in a cycling journal of that period a writer said, "The speed of the pulley is seven revolutions a minute. Enough water can be taken into the boiler to last an hour, and the power of the engine is sufficient to drive the 51-inch bicycle about 12 miles per hour on the floor, or about one mile in eight minutes on the road; hence it will be seen that it would be quite an assistance to the feet in propelling the machine. By unscrewing a couple of bolts the engine can be removed, when there remains a bicycle pure and simple."

The engine of this machine was attached to a lever driven high-wheel bicycle, and readily could be removed from it. After exhibiting the machine throughout California, one of the Copeland brothers came east with it and interested a prominent bicycle manufacturer. The latter sought to improve it by employing a more powerful engine and adapting it to a three-wheeled vehicle. Several steam tricycles suitable for two passengers were constructed by Copeland himself, who remained in the East quite a time in the hope of seeing the manufacture of his machine begun. Although his machines appeared to operate satisfactorily, the public had not become quite ready to accept such a radical departure and notable advancement in transportation facilities, and the machines soon were lost sight of, to remain dear only to the memories of the builders and a few other enthusiasts of those days. Like many other inventors, the Copelands and their motorcycles were far ahead of the time, and their worth unappreciated.

The only other steam motorcycle of which there is authentic record was one made by S. H. Roper of Roxbury, Mass., in 1896. It consisted merely of a standard bicycle of the time, to which Roper attached a steam engine of his own invention. It weighed 150 pounds, but despite its weight and awkwardness, the builder was able to secure considerable use out of it, and as a matter of course, to be the envy of his fellow cyclists when head winds and hills were encountered.

In the meantime, the gasoline motor was making considerable strides toward its present high state of development, and in the year previous to the appearance of Roper's machine, 1895, the first public exhibition of motorcycles in America was held in Madison Square Garden, New York city. Easily the most sensational machine at the show was that of the Motor Cycle Company of Cleveland, Ohio, the leading spirit of which was E. J. Pennington. Pennington was a dreamer, who saw millions in motorcycles, and had little difficulty in persuading many others to accept his belief to the extent of investing in his schemes.

His machine had been put on the road in 1894, and much notice was given it in the press, on account of its alleged wonderful capabilities. There was no ban on the introduction of gasoline in the Garden in those days, and the Pennington machines actually were demonstrated in the basement of the famous amphitheater. Two types were exhibited, a motorcycle and a motor tandem. Many people took advantage of the opportunity to ride in the front seat of the tandem, and with its four-inch pneumatic tired wheels, it certainly was a wonder.

While the Pennington machines were equipped with a gas motor, it was not of the type used to-day, and as a matter of fact, little ever was known of its mechanism, or of the ignition or carbureting apparatus. The motor was attached to an elongation of the right rear stay, and operated on the locomotive principle with an exposed piston rod. It was claimed that kerosene was used, and that one gallon was sufficient to propel the machine 200 miles. One of Pennington's marked abilities was his reckless handling of facts, and he claimed everything under the sun for his machines. Many people swallowed his claims without a whimper.

Pennington claimed to control a patent that covered "any fluid engine or wheeled vehicle having pneumatic tires." The assertion was made that the engine on this machine could run on any oil, but that kerosene was used because of its greater explosive properties. The fallacy of this claim is obvious, and the prevarication later was exposed, with the discovery that gasoline and not kerosene was employed. The frame tube was used to convey the fluid from the reservoir to the motor, which was controlled by pressure of a push button located in the handlebar.

Pennington's project, staggering in immensity, was put forward at a time when bicycles were on the top wave of popularity, and automobiles were just beginning to excite mild curiosity. However, there was no real interest in motorcycles or automobiles at that time, and Pennington's schemes were considered visionary. The motors were prone to overheat on the slightest provocation, and they proved failures, but served to interest persons who later were directly responsible for the real foundation of the American motorcycle industry.

Soon after the show, Pennington suddenly found urgent business requiring his presence abroad, and he left behind many creditors. He later returned, when he supposed that his bubble had been forgotten, to engage in schemes anew. While American inventors were struggling with the motorcycle, it also was receiving persistent attention in several European quarters. Several crude affairs were evolved in 1894 and 1895, but the tide turned so strongly to tricycles that temporarily the two-wheeler was lost sight of.

Prominent among the foreign motorcycles brought out in the late nineties were the Volta, a French steamer; the Duncan, another steam type from the land of Napoleon, but whose designer differed radically from Volta in the idea of power application; and the gasoline model of Maurice Werner, which came on the scene while we were burning powder with Spain in the West Indies in 1898. The Werner was considered a very practical machine for its time, and a number were built, which performed creditably. The motor was staged in front of the handlebars and transmitted power to the front wheel by belt.

To all practical intents and purposes the beginning of the American motorcycle industry dates from the year 1900, when the first American machine that deserves to be called a motorcycle was produced.

The ground once broken, others followed the lead of the pioneer manufacturer, and in a short time a flock of designers scattered about the country announced their models. Notable among these was Emil Hafelfinger of Hoboken, N. J., who brought out a particularly attractive design that remained standard for several years after, although his machine never was a factor in the industry.

While there are approximately fifty different brands of motorcycles built in America to-day, half of this number are produced in insignificant quantities, and the representative makers number about fifteen. Mechanically the motorcycle of 1913 is a very modern vehicle, taking the motor car as a standard. The representative 1913 motorcycle has twin cylinders, this being the predominant type in the industry. Seven horse-power is standard in power rating, and two speeds are conceded far superior to the single speed type.

Magneto ignition also is standard, and chain drive again has gained the ascendancy, after a temporary eclipse in favor of the belt. To-day the chain predominates, and there is a tendency to inclose it from dirt. Two types of engine starters have appeared, but the automatic ratchet type operated by foot pressure has proven most popular. The greatest advance of the present season's models is in increased comfort. This is obtained by the use of cradle spring frames and forks, using leaf springs as in automobiles, inclined footboards, providing a natural leg position as in a car, and abolishing the fatigue of cramped limbs, longer wheelbase and larger tires. Ignition is by waterproof magneto, and lubrication by mechanical pump. Tail pipes and large expansion chambers deaden the exhaust effectually, double brakes assure absolute control, and large tanks afford a wide range of travel on one filling. Although the motorcycle of to-day is considerably cheaper than it was a few years ago, it is the best "buy" the industry ever has offered, and the fact that all prominent makers are swamped with orders indicates that the trade is enjoying the best season in its history, with still better prospects in sight for next year. The motorcycle has established itself in the commercial world permanently, and there its greatest future lies.

The New First Assistant Commissioner of Patents

ROBERT T. FRAZIER of Nashville, Tennessee, has been nominated to the office of First Assistant Commissioner of Patents. He is fifty years old, a native of Tennessee, was appointed to the United States Naval Academy and was graduated from that institution in 1883, but was mustered out after a two years cruise with a number of classmates because there were no places in the service for them at that time.

He entered the Patent Office as fourth assistant examiner in September, 1887, and served in the various grades until his resignation in April, 1893, at which time he was a first assistant and about to be promoted to principal examiner. Leaving the Patent Office, he became a member of the firm of Howson & Howson on July 1st, 1901. In April, 1906, he became a member of the firm of Smith & Frazier, which was dissolved in July, 1910. In September, 1910, Mr. Frazier re-entered the Patent Office as a fourth assistant examiner, since which time he has passed through the intermediate grades and was promoted November, 1912, to the position of first assistant examiner. Like his chief, Mr. Ewing, Mr. Frazier brings to his new position a long experience, including practice within as well as before the Patent Office and in the courts.

More Permanent Creosoting

THE old problem of retaining the creosote in treated timbers seems to be solved in the new plan of applying the creosote with paraffin or stearic acid heated to the melting point. Of course the wood must be hot also. The mixture or solution of liquids penetrates to the heart of the timber, and on cooling the paraffin or stearic acid solidifies, holding the creosote permanently in the pores.

Trucking Inside the Factory

THE cost of transporting material and partly finished parts from one point to another within a factory is apt to reach a much higher figure than one would imagine, particularly where the transportation does not take place over any great distance and it does not pay to employ any special trucking method. In such cases the work has to be done with hand trucks, but even with the hand trucks improvements are possible which will result in considerable saving. In the accompanying illustration we show a three-wheeled transveyor, the forward wheel of which is swiveled to allow the making of short turns, while the superstructure is so arranged that it may be elevated or depressed with relation to the main frame of the truck. To make possible the transportation of "tote" boxes or platforms, it is merely necessary to provide them with shoes or skids of sufficient height to permit of introducing the transveyor under them. Then the simple action of pulling the handle or the tongue of the transveyor forward from the perpendicular to the horizontal position will elevate the box with its load, when it may be wheeled to any other part of the factory. To lower the load it is only necessary to step on a pedal while holding the handle in a horizontal position, and then let down the platform by raising the handle until it is perpendicular, after which the transveyor may be withdrawn. The elevating mechanism is designed to multiply the leverage sixteen to twenty times, so that very heavy loads may be elevated. After the load is elevated the weight serves to lock the mechanism in raised position through the action of toggle or knuckle joints, leaving the handle free for drawing and steering the truck.

Towing a Locomotive With an Automobile

THE average automobilist, who does not realize fully the enormous power of his car, would perhaps have a better notion of this if he had been a witness of a rather unusual test in California. A 40 horse-power touring machine weighing 4,000 pounds, was attached, by means of a strong cable, to a 110-ton locomotive. The cable ran from the axle of the car to the cowcatcher of the locomotive. The start was made from a dead standstill. For some time the motor car groaned, and vibrated to no avail. The wheels refused to find a purchase and slipped around and around. Finally, half a dozen men were put into the car to do duty as ballast. This additional weight had the desired effect. With slow reluctance the wheels of the monster in tow began to revolve, and the automobile had achieved the seemingly impossible task of drawing so tremendous a weight.

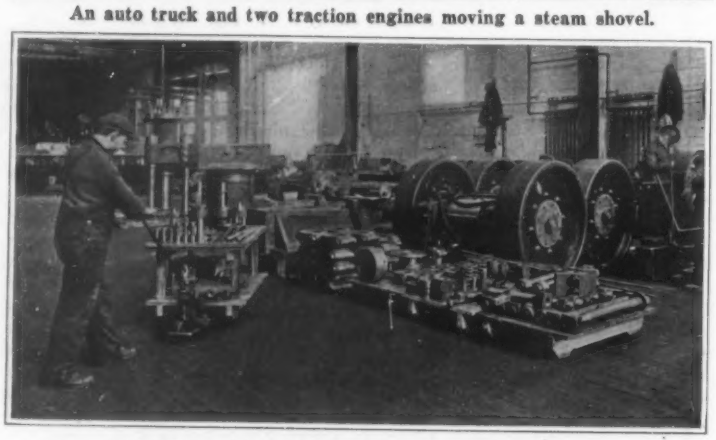
No injury to the car resulted from this great and unusual strain, and for some distance over the rails the mass of iron obediently tagged after its puny pilot.

The demonstration was made by an automobile agent to show what a really powerful machine the motor car of today is.

Automobile That Will Run Submerged

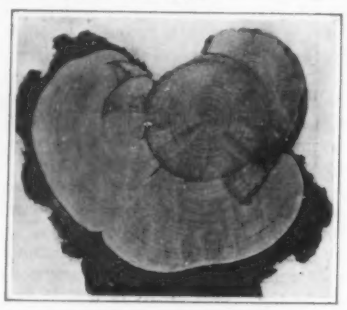
WE have seen automobiles running when partly submerged, but it is decidedly unusual to find one that will work when practically everything is submerged except the driver's seat. This is now done in a new French automobile that is intended mainly for use in the colonies, where the car is likely to be required to cross rivers. It will be quite valuable for making trips in these regions, where the road is barred to the ordinary automobile by streams which of course have no bridges. The exhaust from the motor is taken off by a pipe which projects well out of water to the rear of the driver's seat. Air for the carbureter is fed through a pipe directly in front of the driver. The only limit to the immersion of the car is to have the driver's body out of water, and in fact it could even be sunk somewhat deeper than is represented here, provided the driver did not mind being wet.

An auto truck and two traction engines moving a steam shovel.

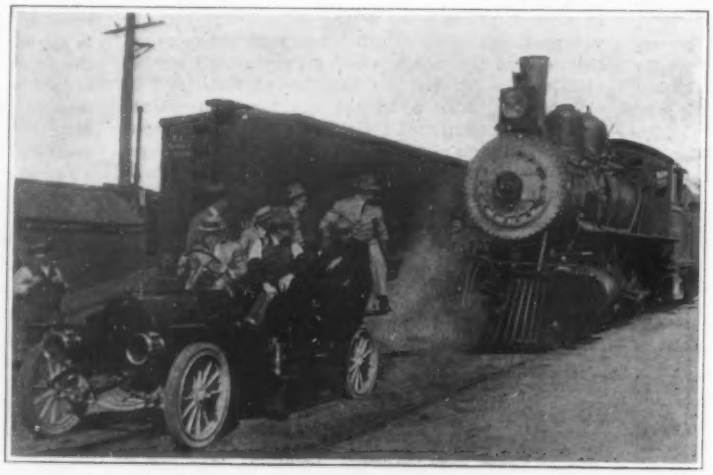


Handling castings with a three-wheeled transveyor.

Cone of lodgepole pine entirely buried in the wood.



Section of bull pine showing results of repeated fires.



Towing a 110-ton locomotive with a 2-ton automobile.

An automobile that will run under water.

Moving a Seventy-ton Steam Shovel

PICTURED in the accompanying engraving is an odd procession that recently wended its way across country in Montana. It was found necessary to move a seventy-ton steam shovel from Plentywood, Montana, on the Great Northern Railroad to the Soo Line work. The giant steam shovel was mounted on moving trucks of the type used for house moving, consisting of three units of four wheels each. The power employed for moving the shovel comprised two traction engines and a large motor truck. The procession moved 24.2 miles in eight days, over country roads and fields. The temperature at the time averaged ten degrees below zero. Only four laborers were employed. The cost per mile of moving the shovel amounted to $48. It is claimed that for tonnage of shovel and distance moved, a record was established.

Peculiarities in the Growth of Trees

THE forester depends very largely on the annual rings of growth not only to determine the age of trees, but also to calculate the growth and yield of individuals and forests. Sometimes they serve a different purpose. A few years ago, in a lawsuit involving a forfeit of $25,000 as surety against the cutting of timber on alleged Tennessee State land, sections of tree trunks taken near the ground were admitted as evidence in locating an old stream bed which marked the boundary of the original grant. This was made possible through the fact that the timber on the newer land was younger than that on the original banks of the stream and was also even-aged instead of all ages, thus showing that the change in the bed of the stream had been made rather suddenly and comparatively recently.

The occurrence of a severe fire, an insect infestation, an unseasonable frost, or periods of abundant rain or of drought may be read from the effects produced upon the structure of the wood from year to year. If a fire is severe enough to destroy portions of the cambium or growing layer of a tree the wound will eventually grow over from the edges. Even if entirely effaced from the outside it will appear upon cutting open the tree, and if the number of rings is counted from the very edge of the wound to the bark the time of the fire can be determined with accuracy. The section shown in the illustration is of a western yellow pine repeatedly fire-scarred, but able in each case to survive the injury.

The tendency of a tree to cover up an object attached to it is commonly observed in the growing over of nails and wires. In the accompanying photograph is shown a pine cone naturally buried in the heart of the tree on which it grew. The cones of lodgepole pine are small and usually persist on the tree for many years without opening. In this case a cone remained so long that it was caught by the growing wood and completely enveloped.

European Dress in China

ACCORDING to the American consul at Swatow, shortly after the revolution of 1911-12 there was a marked tendency among the middle and upper classes of Chinese to adopt European dress. Although the bulk of the people could not afford to follow this fashion, there was for a time great demand for all sorts of foreign wearing apparel. Lately, however, a reaction has set in, and it is said that of those who adopted foreign dress last year perhaps 60 per cent have gone back to native clothing. Silk, after declining in price about a year ago, has lately risen again by 20 per cent, evidently on account of the reaction referred to.

Inventions New and Interesting

Simple Patent Law; Patent Office News; Notes on Trademarks

Thomas Ewing, Jr., the New Commissioner of Patents

AFTER an efficient administration of six years Edward B. Moore retires from the Patent Office and makes place for Mr. Thomas Ewing, Jr.

The patent bar as well as inventors in general have reason to be pleased with Mr. Ewing's appointment; for like his predecessors, Moore, Allen, and Duell, he served for a time on the Patent Office staff. He is therefore thoroughly familiar with the ways of the Office. On October 22nd, 1888, he entered the Patent Office as an assistant examiner after having passed the usual Civil Service examination. He resigned on October 9th, 1890, having meanwhile been promoted.

After leaving the Patent Office Mr. Ewing engaged in the practice of law in New York as a member of the firm of Ewing & Ewing. As might be expected, he has made a specialty of patent cases, thus supplementing his fundamental Patent Office experience with actual active practice, both in soliciting and in contested work before the Patent Office and the courts. Mr. Ewing is therefore an incumbent who knows from experience both sides of Patent Office procedure.

Although a specialist in patent law, Mr. Ewing is also a business man; for he is president of the Current Literature Publishing Company. He has always taken an active interest in municipal affairs and economic conditions and was Democratic candidate for mayor of Yonkers in 1897 and 1899.

It will interest manufacturers and inventors to know that Mr. Ewing testified before the Congressional Committee on Patents last year and strongly disapproved of the Oldfield Bill on that occasion.

A Controlled-key Adding and Calculating Machine

A MODEL of an adding and calculating machine just put upon the market contains several radical improvements which are said to be revolutionary in their effect on correctness of operation. The object of these improvements is to eliminate to the last possible degree the human element of error and thus guard against the mistakes of mis-operations due to the inexperience of beginners or the carelessness of experienced operators. This controlled-key machine compels correct operation. The automatic features introduced to accomplish this astonishing result are: Interference guards at the sides of key-tops to prevent accidental depression of a key adjacent to the one being operated; automatic locking of all other columns when any key is not given its full down stroke; an automatic block against starting any key down again until the up-stroke is completed.

The significance of the first of these automatic features is quite apparent. It is obvious that in a duplex machine, where two or more keys in different columns may be operated simultaneously, a key standing next to the one intended to be touched may be accidentally depressed far enough to cause the unintentional adding of a number in another column. This cannot happen in the new machine, because the key is made in two parts, so as to prevent its depression except when struck squarely on top.

The second and third automatic added safeguards make the machine practically proof against the faults of the operator. In order to perform their proper function and correctly add their respective numeric values, the keys must, of course, be given their full determined travel on both the downward and return strokes. Correct touch is quickly acquired and soon becomes a fixed habit with the experienced operator, who is able to work at high speed with marvellous accuracy even without the aid of the controlled-key. The beginner, however, tempted by the rapid action of the machine, may try to go too fast at the start and by a slurred or partial key stroke, make it add a wrong amount. With the controlled-key feature such errors, whether due to carelessness or inexperience, are impossible. If a key is not given its full downward stroke, the keys in all the other columns are immediately locked and the numeral wheel in the column where the error is made shows a figure at the sight opening, standing out of alignment in a direction nearer to the operator. He can tell which key was mis-operated in that column by looking at the figure of the last item added in that column.

In case of mis-operation on addition, if many numbers have already been added, the mistake is corrected by completing the unfinished stroke of the partially depressed key. A release button which stands close to the 9 key is then depressed and the operator proceeds with the addition.

If the operator attempts to start a key down again before letting it clear up on the return stroke, his effort to do so is instantly blocked by an automatic lock device which absolutely prevents reversal of the upward movement until it has been completed.

These improvements comprise what is in effect an automatic block system against mis-operation, which not only notifies the operator of his fault, but compels its correction.

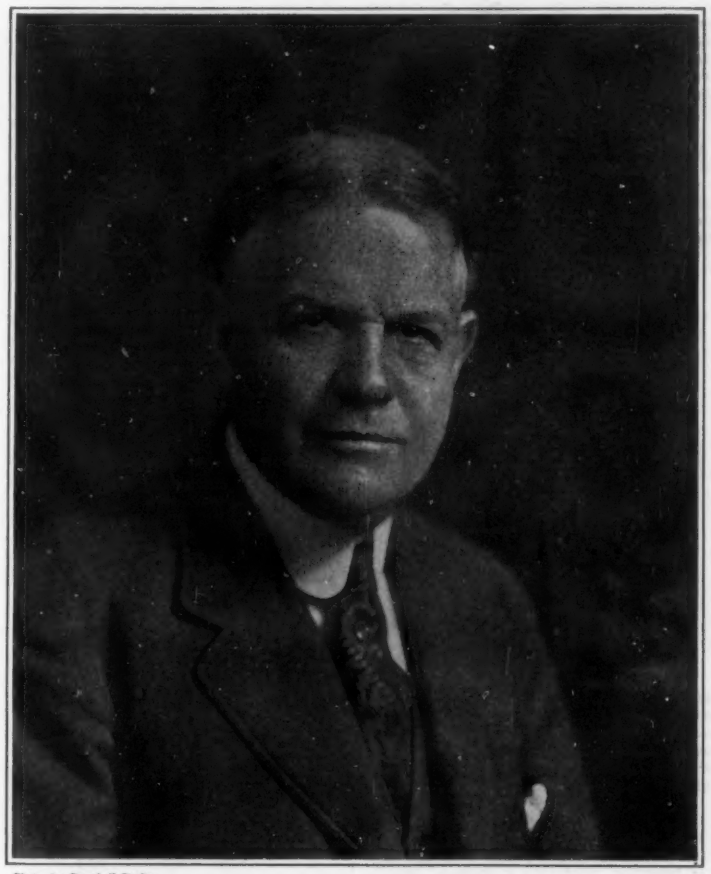


Photo. by Campbell Studios.

Thomas Ewing, Jr., the new Commissioner of Patents.

A French Telephone Experiment

SOME French government engineers have recently been experimenting with telephone systems seeking to avoid inconvenience to those absent from their offices or homes when others call them by phone. The experiments were made in connection with a number of subscribers of a Paris exchange whose telephone instruments were fitted with a special magneto. On turning a handle of this magneto a lamp would be automatically lighted at the desk of a special employee, who on receiving such signal cuts off the connection with the subscriber's number and receives the calls for such number and notes down such communications as persons calling up such subscriber in his absence desire to give him. On the subscriber's return to the office another turn of the magneto handle notifies the special operator that the subscriber can receive further calls and all communications received during his absence can be transmitted to him. It is claimed that the system is technically a success and the question of extending it to all subscribers is being considered.

What Seems a Bad Practice

THE writer a short while ago, waiting for the elevator in the Patent Office building at Washington, overheard a conversation between two young practitioners, apparently, but unknown to him, which indicated what seems to be a very improper practice. One said to the other: "He has a number of applications in the Office and I don't know what they cover, but I think I will slip in an application and find out." His purpose was evidently to file an application for patent for the purpose of ascertaining the subject-matter of some application or applications which had been filed by an another applicant in good faith. In thinking how this could be done without actual perjury it occurs to the mind that one might purchase a device on the market upon which application for patent had been filed and make some addition to it and file an application for patent containing only a claim for the addition. In some, if not many, of the divisions of the Patent Office claims would be suggested, for purposes of interference with a previous application for the original invention and the second applicant could insert such claims if he desired an interference with a previous application for the original invention and the second applicant could insert such claims if he desired an interference even without the formality of a supplemental oath. Or if he did not desire an interference, as he would not in the case above supposed, he would have obtained information from the Patent Office that an application for patent was pending and contained claims, the suggested ones, which were deemed by the Patent Office to be patentable. The reprehensible practice above outlined should be avoided or blocked either by a stricter observance of rules in force, or by the institution of other rules which would effectually prevent the practice.

Home-made Lawn Rollers

MUCH ingenuity and considerable invention is displayed in the production of lawn rollers for domestic use. These are sometimes made of cement and frequently with the aid of terra cotta or metal pipe of uitable length open at both ends and in which the cement is poured, forming a solid roller. Recently the writer saw a home-made roller in which the trunnions for the handle projected beyond the cement and these trunnions were at the ends of a rod which extended through the cement and had its central portion flattened and perforated by bolt holes through which bolts passed to secure a number of short lengths of scantling which were used as filling blocks to reduce the amount of cement and thus lessen the weight of the roller. When terra cotta pipe is used, it can, when cracked, be entirely removed from the roller leaving the cement roller intact. An ordinary lawn mower handle with arms of wrought iron which can be made by any blacksmith, supplies a suitable handle for the roller and the entire cost is said to be very much less than the ordinary commercial roller.

Some Early Patent Office History

DOCTOR THORNTON, the first Superintendent of the Patent Office and who was appointed in 1803 by Jefferson to issue patents, continued in such office until 1827, a period of 24 years, his administration of the Patent Office being, it is believed, much longer than that of any of his successors. William Elliott, one of his associates who left the Patent Office in May, 1829, in writing a letter dated January 16th, 1830, to John D. Craig, the then Superintendent of the Patent Office, said of Dr. Thornton, "he conceived himself to be invested with and exercised freely much discretionary power in the issuing of patents; for he held it as a maxim, and I believe a very good one, that the patent law was made solely for the 'encouragement of authors and inventors' and not to collect revenue." It is refreshing to find that such a spirit was entertained so early in the history of the United States Patent Office.

Another Magazine Tobacco Pipe.—A patent, No. 1,058,232, for a tobacco pipe, the invention of Selim W. Gunn of Feeding Hills, Mass., shows in a tobacco pipe a stem which has the usual smoke passage which communicates with the bowl midway between the top and bottom and a magazine is arranged under the stem and communicates with the bottom of the bowl through an opening controlled by a shield, a plunger operating in the magazine to force the tobacco therefrom into the bottom of the bowl.

RECENTLY PATENTED INVENTIONS

These columns are open to all patentees. The notices are inserted by special arrangement with the inventors. Terms on application to the Advertising Department of the SCIENTIFIC AMERICAN.

Pertaining to Apparel.

COLLAR BUTTON.—W. COCKCROFT, 185 So. 4th St., Brooklyn, N. Y. This invention has particular reference to a fastener for men's dress collars. The special object is to provide a button whereby it is possible to obtain a close fitting collar, especially of the type having an extension lock, without soiling or breaking the collar.

COLLAR FOR SHIRTS.—B. SUNSHINE, 555 Liberty Ave., Brooklyn, N. Y. This invention relates to wearing apparel and provides a soft collar for shirts, arranged to permit wearing the collar in turned-down fashion or in high doubled-up style to suit the convenience and comfort of the wearer.

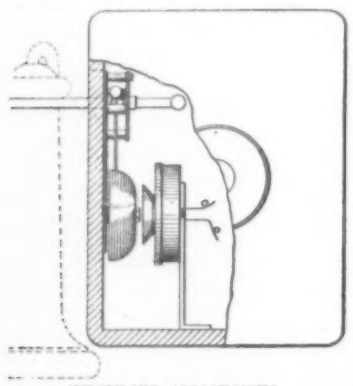
Pertaining to Aviation.

AEROPLANE.—G. JOHNSTON, Richmond, Va. The safety means of this device consist of a series of pivoted wings which may be so manipulated as to provide resisting surface in case of sudden descent forward or backward. The wings also serve for restoring the device to normal position where it is tipped and may, therefore, be used in lieu of the ordinary ailerons or wing warping devices.

Electrical Devices.

MEANS FOR CLEANING SHIPS' HULLS.—G. J. KINDERMANN, Park Terrace, Wayville, S. Australia, Australia. In carrying out this invention Mr. Kindermann provides a rotary brush or scraper which is electrically driven by an incased motor upon which the eyes or rings are mounted so that the appliance is adjustably suspended and operated from the deck of the vessel.

TELEPHONE ATTACHMENT.—A. SCHLOSSER, Dodge, Neb. This invention pertains to improvements in telephone attachments, and has particular reference to devices of this character devised for the purpose of detecting the



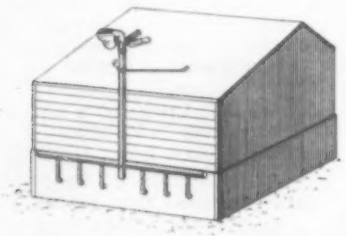
TELEPHONE ATTACHMENT.

interference with party lines due to unauthorized parties listening to a conversation. An object of the improvement is to provide a detector of the nature indicated which will be simpler and more effective than those heretofore ordinarily proposed.

Of Interest to Farmers.

BLUE GRASS SEED HARVESTER.—S. E. MCCORMICK, McCormick Bros., Winchester, Ky. An object of the invention is to provide a device by means of which blue grass seed may be stripped from the stem and collected in sacks or other receptacles at a maximum rate and with very small loss of seed.

VENTILATOR FOR BROODER HOUSES.—C. W. BRICK, Crosswicks, N. J. This invention relates particularly to a means for ventilating brooder houses, and provides an improved form of ventilator and in connection therewith,



VENTILATOR FOR BROODER HOUSES.

means for heating the air inducted by the ventilator; and to provide a safety valve exteriorly of the brooder house, whereby to prevent the delivery of too strong a current of air thereto.

MOTOR PLOW.—F. B. HOUDEK, Cuba, Kan. This invention relates especially to motor operated plows. Among the objects of the inventor is to construct a motor plow whose frame is of novel construction whereby the implement is adapted for better, easier and more economical service than is common in this class of machinery.

WHEAT CLEANER.—J. J. RAMSAUR, care of R. S. Costner, Lincolnton, N. C. This invention has reference to machinery for winnowing or cleaning grain in mills or elevators, and has particular reference to a machine of this type indicated for the thorough cleaning of wheat preparatory to the manufacture of the highest grades of flour in a flour mill.

Of General Interest.

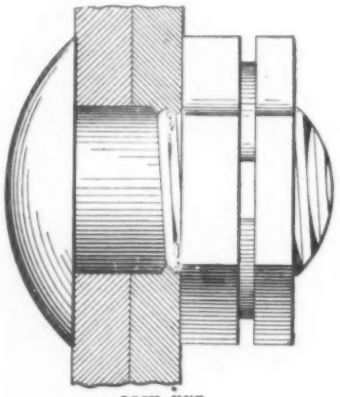
GASOLINE SEPARATOR.—C. S. WEISS, Continental Ave., Belleville, N. J. In this case the separation is gravitational, and the invention has reference more particularly to a device comprising a funnel having a segmental diaphragm and a plurality of valve-controlled outlets all below the diaphragm.

MOLD FOR ELECTROTYPING PROCESSES.—A. J. TIZLEY, care of E. F. Caldwell & Co., 36-40 W. 15th St., New York, N. Y. In this instance the invention has reference to molds for use in electrotyping processes using a cyanide bath and more particularly it is directed to a new and improved mold which is unaffected by the cyanide bath or by temperature variation.

STRAP LOOP.—L. SANDERS, 621 Broadway, New York, N. Y. This invention relates to metallic loops for various straps, including belts, but has more particularly for its design the production of a spring loop for use on gun slings especially of army rifles, where a closed loop cannot be passed onto the sling from an end thereof, owing to the other fittings of the sling.

Hardware and Tools.

LOCK NUT.—I. D. ZITZERMAN, 3518 Montgall Ave., Kansas City, Mo. The invention pertains to lock nuts to be used with the ordinary nuts of bolts in railway joints, and in other situations where nuts are subjected to vibration. It relates particularly to concave



LOCK NUT.

nuts. The inventor provides a nut having a concave side in which the threads will be free from mutilation at the concave side and thus readily engage a bolt. Gripping means provide for engaging the opposed face of the ordinary nut with increased effectiveness.

Heating and Lighting.

GAS FURNACE.—E. H. TROTTER, care of Driver's Union Stock Yards, Columbus, Ohio. The invention relates to a form of gas furnace, and an object is to provide a furnace having relatively large radiating surfaces in proportion to the fire zone. Heated air is rapidly and economically carried away from the furnace through the heat-carrying pipes. In this furnace the flame is in direct contact with the radiating member.

LENS SUPPORT.—W. T. FIELD, C. E. JONES, and F. T. FIELD, care of F. T. Field P. O. Box 1245, Sanford, Fla. The purpose here is to provide an improved lens support for use in lamps and arranged to permit of conveniently and quickly adjusting the lens relative to the source of light with a view to concentrate and direct the rays of light to a desired point or object for reading.

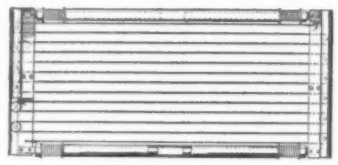
OIL BURNER.—R. H. ECKHARDT, Yorktown, Tex. In the present patent the aim of the invention is to provide a new and improved oil burner arranged to insure the formation of a thorough mixture of oil, air and a fluid under pressure, such as steam or compressed air, and to prevent flooding of the burner with surplus oil.

Household Utilities.

BATH ACCESSORY.—F. HESS, 511 5th Ave., Kalispell, Mont. This invention provides a frame for holding a wash cloth or similar device wherein the cloth or device is quickly and readily adjusted to the frame; provides means for mounting the frame in service position upon a bath tub; and provides a frame having a convex surface.

LACE CURTAIN HANGER.—J. G. HUGHES, Newark, Ohio. The brackets are made so as to make them easily applied to the framework regardless of the width of the frame so that the brackets may be securely held by the direct curtain supporting element, provision being made for the removal of the brackets without use of screws, nails, etc., which are sure to mar more or less the appearance of the woodwork.

BED BOTTOM.—J. H. PIELERT, care of Charles P. Pielert, 232 St. Paul St., Baltimore, Md. The invention relates to bed bottoms provided with a flexible member of wire, rope, or cable which is normally maintained under tension to support the mattress and related bed



BED BOTTOM.

parts. More particularly stated, in a bed bottom a single cable is extended back and forth lengthwise or crosswise of the bottom and the tension of the cable is there distributed and equalized automatically. The bed bottom is provided with improved mechanism for varying at will the tension of the cable.

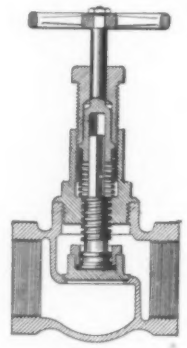
Machines and Mechanical Devices.

CLOTH LAYING MACHINE.—M. ISAACS, care of the Shuttle Co., 18 E. 17th St., Manhattan, N. Y., N. Y. This invention is designed to take cloth, such as woolen cloth that is folded in half, lengthwise, and lay it upon a table in an even pile of layers, for the purpose of cuting it into pieces, to make parts of clothing. The machine is made to take pieces of such cloth which are either in a roll or in folds.

CASH REGISTER WITH A SINGLE SET OF KEYS.—R. T. PISCICELLI, via Pietrapiana N. 46, Florence, Italy. This invention refers to improvements in that class of cash registers having a single set of keys, viz., only ten keys corresponding to the figures from 0 to 9, and by means of which numbers having any amount of figures can be summed up, for the arrangement is such that the key which is pressed down the first time puts into motion the mechanism for registering the higher units of the number; the key which is pressed down secondly puts into motion the mechanism for registering the units of the order immediately below, and so on.

Prime Movers and Their Accessories.

VALVE.—E. BISHOP, 401 N. 7th Ave., Jamestown, N. D. The improvement relates particularly to valves intended to be located in steam pipes to shut off and regulate the supply of steam flowing therethrough to a



CONDUIT VALVE.

point where the same is made to do its work; and it comprises a construction wherein the valve head while being moved by the stem, at the same time has a movement independently thereof, and wherein the stem is protected against action of the steam to guard against wear and corrosion.

METHOD OF MAKING HOLLOW PISTONS.—H. H. PATRICK, 50 Sandwell road, Handsworth, Birmingham, England. This invention relates to pistons employed more especially in internal combustion engines for motor road vehicles and the like, and the object is to construct a piston which reduces the inertia effects and wear experienced with ordinary pistons, is cheaper to construct and is capable of being very conveniently case-hardened.

Railways and Their Accessories.

RAIL JOINT.—J. F. FORSYTH, Bloomington, Ind. This invention provides a joint which will have the same efficiency and safety under great difference of temperature, and which will increase the bending resistance of the joint. The joint comprises spliced plates provided with fillers, having a higher coefficient of friction with the rail than the plates and having a key in one of said plates engaging the webs of the rails.

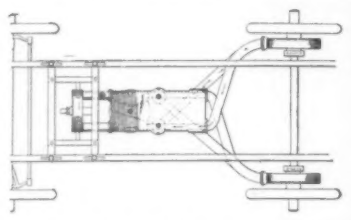
Pertaining to Recreation.

GAME APPARATUS.—E. L. GRONDAHL, care of State Bank of Seattle, Seattle, Wash. The object of the invention is to provide a new and improved game apparatus arranged to permit two, three or four persons to participate in the game and to afford considerable amusement and pastime to the players. For this purpose use is made of a game board and counters.

ROLLER SKATE.—T. SPACIE, 154 Grunewald St., Blue Island, Ill. In this skate the construction is adapted to possess the maximum degree of strength and reliability, together with the minimum cost of production. It is adapted to the widest range of adjustability yet maintaining in adjustment the maximum strength. It is practically all of sheet metal.

Pertaining to Vehicles.

FLUID TRANSMISSION FOR MOTOR VEHICLES.—E. B. VAUGHAN and F. T. KLASGYE, 626 E. 128th St., Cleveland, Ohio. In this patent the object of the invention is an improvement in the construction of motor vehicles in which a circulating liquid is substi-



FLUID TRANSMISSION FOR MOTOR VEHICLES.

tuted for gearing for transmitting power from the motor to the driving wheels. The engraving herewith shows a diagrammatic plan view of the chassis and wheels of an automobile, as applied thereto.

MECHANISM FOR CONVERTING RECIPROCATING INTO ROTARY MOTION.—R. W. J. SMITH. Address F. M. Nash, Gen'l. M. M., Texas State Prisons, Huntsville, Tex. The object here is to provide a device for connecting a driving shaft with one or more driven shafts, in such manner that while the driven shafts are continuously rotated by the driving shaft, the relative speed of the driven shafts with respect to the driving shaft may be easily and quickly changed.

SPRING WHEEL.—O. H. HINDS, care of Le Mars Gas Co., Le Mars, Iowa. The wheel patented herewith is of a class embodying an outer rim section and an inner section, the outer having radially movable piston spokes guided in sockets in the inner. The novelty lies in the special form and arrangement of the piston spokes and their guide sockets.

NECK YOKE.—G. YOUNG, Box 741, Mora, Minn. An object of this inventor is to provide an inexpensive neck yoke simple, light and durable in construction, having three points of bearing on a wagon tongue and affording a free oscillatory motion in all directions, thereby adjusting itself to any position of the horses.

Designs.

DESIGN FOR CARPET OR RUG.—W. E. SAYERS, care of G. S. Squire, 25 Madison Ave., New York, N. Y. In this ornamental design, No. 44,032, for carpet or rug, the border arranged in several bands and the field are all designed in geometrical patterns of exquisite forms. Mr. Sayers has also designed another carpet or rug, No. 44,033, whereof the border comprises narrow bands of minute figures surrounding one of flowers. The field is elaborately designed with scrolls, vines and flowers amid which is a beautiful centerpiece.

DESIGN FOR CARPET OR RUG.—J. G. PEGEL, care of G. S. Squire, 25 Madison Ave., New York, N. Y. In this ornamental design, No. 44,023, for carpet or rug inside of a border lies a farm scene comprising trees, house, pasture, a girl and five sheep.

DESIGN FOR A MACHINE STAND.—M. TAIGMAN, 239 Wooster St., New York, N. Y. In this ornamental design for a machine, the frame, comprising uprights, connecting pieces and base is delineated in graceful, yet simple lines.

NOTE.—Copies of any of these patents will be furnished by the SCIENTIFIC AMERICAN for ten cents each. Please state the name of the patentee, title of the invention, and date of this paper.

WE wish to call attention to the fact that we are in a position to render competent services in every branch of patent or trade-mark work. Our staff is composed of mechanical, electrical and chemical experts, thoroughly trained to prepare and prosecute all patent applications, irrespective of the complex nature of the subject matter involved, or of the specialized, technical, or scientific knowledge required therefor.

We also have associates throughout the world, who assist in the prosecution of patent and trade-mark applications filed in all countries foreign to the United States.

MUNN & Co.,
Patent Attorneys,
361 Broadway,
New York, N. Y.

Branch Office:
625 F Street, N. W.,
Washington, D. C.

Notes for Inventors

Assistant Commissioner Tennant Resigns.—Assistant Commissioner of Patents, F. A. Tennant, has resigned his office to enter into the practice of patent law in Boston. Mr. Tennant entered the Patent Office in 1895 and was promoted from time to time until in July, 1909, when he was appointed Assistant Commissioner. At this writing his successor has not been designated.

Protecting Baseball Fields During Rain.—Patents, Nos. 1,063,198 and 1,063,199, to Robert L. Hedges and Arthur M. Branch of St. Louis, Mo., provide for covers which can be extended to protect baseball fields as well as for booms and masts for supporting the covers and adjusting them in umbrella fashion over the field to be protected.

A Self-watering Flower Pot.—William A. Scribner in patent, No. 1,063,395, shows a flower pot in connection with a water receptacle arranged above it and having conduits leading down to the pot with a valve by which the flow of the water may be regulated.

A Thomas A. Edison Reproducer.—Thomas A. Edison, assignor to Thomas A. Edison, Incorporated, has secured patent for a reproducer for talking machines in which is provided a diaphragm composed of a number of superposed sheets of Japanese paper united unto a unitary structure. An elastic yielding member is located concentrically with one of the faces of the diaphragm and extends into proximity to the periphery thereof, and the said elastic member decreases in thickness from the center to the periphery. The patent is No. 1,055,621.

A Return Envelope Long Retained.—As indicating the persistence of advertising and the tenacity with which some people retain a paper or an address, it is noted that the Washington office of Munn & Co. recently received a return addressed envelope with the printed address of such office at the corner of 7th and F Streets, while the office was moved from such location on the last day of the year 1885 more than twenty-seven years ago.

A Confidential Telephone Transmitter.—Maximilian Weil of New York city, in patent, No. 1,058,120, shows a telephone transmitter in which there is combined with the diaphragm a speaking chamber which is adapted to receive and prevent the escape of a sound wave of speech, such chamber being formed with vacuum jacketed walls and with a mouth piece conforming approximately to the mouth of the speaker.

A Computing Scale with Automatic Cut-off.—A San Francisco inventor, John J. Duffie, has secured a patent, No. 1,057,811, for a computing scale. It has a hopper normally closed and a latch adapted to hold the gate open with an electro-magnet, which, when energized, will open the latch. The computation chart of the scale has a hand which can be placed at the desired point on the chart. Another hand, operated by the weighing apparatus with electrical circuits, energizes the magnet when the two hands are brought together to close the circuit

Statue to an Inventor.—Robert Fulton has a statue in the hall of fame, Statuary Hall of the United States Capitol at Washington. Inventors who visit the building will doubtless be interested in this imposing work, which represents Fulton seated with a model of a steamboat in his hand. The statue was executed in 1881 by Howard Roberts and was purchased by the State of Pennsylvania at a cost of $7,500. It was placed by the State in Statuary Hall and was formally accepted by the Congress in 1889.

Some Official Potato-peeler Correspondence.—A Washington, D. C., paper recently published a news item the heading of which suggested that the Navy Department wanted a potato-peeler that would pare irregular shapes. A machine company objected to the publication and presented correspondence with some Bureaus of the Department disclaiming any search for more satisfactory machines, while the chief of another bureau in a memorandum to the head of the Department stated that "the press notice relative to potato-peeling machines emanated from this bureau. The bureau would regret any criticism that would injure the business of any firm making efficient machines, but it must be noted that the maker of an efficient machine would undoubtedly seize the advantage offered by publicity by proving by demonstration that his device is effective. No prolonged test is necessary in such a case, and the proof or disproof can be seen by a glance at the peeled potato. No criticism can thus injure an efficient machine."

Wanted: Machinery for Levee Building.—It is pointed out in the *Engineering News* that "The levee along the lower Mississippi River from Cairo to the Gulf contain nearly 250,000,000 cubic yards of earth, a greater volume than the total excavation on the construction of the Panama Canal. Practically all this work on the Mississippi levees has been done by either hand-power or horse-power. The negro pushing a wheelbarrow and a team of mules pulling a drag scraper represent the motive power and tools by which almost all this enormous volume of earth has been moved. At the present time the probability seems strong that a great addition will be made to the Mississippi levees during the next four or five years. The floods of 1912 and 1913, following in such close succession, have aroused the people of the valley to the realization that the present levee system, while it has for a long term of years, from 1897 to 1912, kept practically all the flood waters off the lands of the delta, is not secure enough and high enough to guard the years of exceptional flood. It is probable, therefore, that during the next five years many millions of cubic yards of earth will be added to the Mississippi levee line, and there seems to be an opportunity here for the manufacturers who have developed new forms of excavating apparatus and earth-handling machinery and for the contractors familiar with the use of such machines to prove the value of these devices."

The Unique Organization of the Patent Office.—The Patent Office, as at present constituted, presents a condition of affairs believed to be unrivaled in any civil department of the Government. We have here one of the most important bureaus ever instituted by the Government. In it the head, his two assistants, the chief clerk, all the law clerks, the board of examiners-in-chief and the chief of the classification division, the entire ranking official force of the office, are men who entered the office at the lowest grade of the examining corps and have passed through the intermediate grades to their present positions. There is not recalled a previous administration of the Patent Office in which the Commissioner entered the office in the lowest grade and proceeded through the several grades in continuous service until he had reached the position of Commissioner. This is true of his two assistants as well and of the other officials specified above. No other civilian bureau of the Government exemplifies so well the operation of the Civil Service. It seems fitting that the office should be so constituted since it deals with technical questions of mechanical and other sciences and law and requires long training for the efficient performance of the duties of its officials. The present Commissioner has had unusually long experience at the head of the office, and in the assistant commissionership, since he was appointed assistant commissioner in 1901 by President McKinley and served as such until 1907 when he was appointed Commissioner by President Roosevelt.

A Gas-engine Starter.—Russel J. MacLaren of Grand Rapids, Mich., assignor to N. Jay MacLaren of same place, has a patent, No. 1,058,247, for an engine starter in which a tank containing fixed gas under pressure is connected with the intake manifold of the engine, a valve controlling the flow of gas to the manifold and means are provided for simultaneously opening such valve and for cutting out the firing mechanism of the engine so that the engine will stop with one or more charges in the cylinders, containing a quantity of fixed gas, together with means for firing the charges to start the engine.

CARBON DEPOSIT—How to reduce it

Considerable nonsense is current about carbon deposit.

Any product that will burn must be largely carbonaceous.

Lubricating oil will burn and is therefore plainly carbonaceous. Non-carbon oils cannot exist.

But the amount of carbon deposited depends on the carburetion and gasoline combustion, and on the character of the gasoline, as well as on the lubricating oil itself and its fitness for the car.

The presence or absence of carbon deposit in no way determines the lubricating efficiency of the oil.

Flames prove the presence of Carbon. The elements of carbon deposit always appear in the resulting smoke and ashes.

Under identical conditions, however, some lubricating oils will give much more carbon deposit than others. This is due, in part, to three conditions:

(1) The crude oil from which the lubricant was manufactured may have been unsuited to gas engine purposes.

(2) The oil may have been improperly manufactured or filtered.

(3) Its "body" may permit it to work too freely past the piston rings into the combustion chambers.

To reduce carbon deposit, it is absolutely necessary to use an oil whose "body" is suited to your piston clearance.

In our chart of recommendations (printed in part on the right) we specify oil of a "body" suited to the piston clearance and other lubricating conditions in each motor.

The oils themselves are scientifically manufactured from the crude bases best suited to motor car lubrication.

They are thoroughly filtered to remove free carbon and other impurities.

If you are particular about your fuel, and your carburetion and ignition, the grade of Gargoyle Mobiloil specified for your car will put an end to unnecessary carbon troubles.

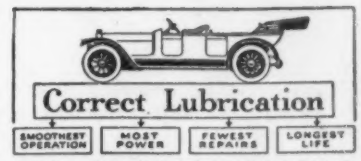
Motorists often select their lubricating oil with an indifference that is little short of reckless. The penalty is paid in a multiplicity of motor troubles.

If you use oil of less-correct *"body,"* or of lower lubricating *quality* than that specified for your car in our chart, unnecessary friction must result. Serious damage will ultimately follow.

In buying Gargoyle Mobiloil from dealers it is safest to purchase a full barrel, half-barrel or a *sealed* five-gallon, or one-gallon can.

Make certain that the name and our red Gargoyle appear on the container.

A booklet, containing our complete lubricating chart and points on lubrication, will be mailed on request.



Explanation: In the schedule, the letter opposite the car indicates the grade of Gargoyle Mobiloil that should be used. For example: "A" means "Gargoyle Mobiloil A." "Arc." means "Gargoyle Mobiloil Arctic." For all electric vehicles use Gargoyle Mobiloil A. The recommendations cover both pleasure and commercial vehicles unless otherwise noted.

MODEL OF CARS	1909 Summer	1909 Winter	1910 Summer	1910 Winter	1911 Summer	1911 Winter	1912 Summer	1912 Winter	1913 Summer	1913 Winter
Abbott Detroit			A	Arc.	A	Arc.	A	Arc.	A	Arc.
Alco	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.
American	A	Arc.	A	Arc.	A	Arc.	A	Arc.	A	Arc.
Apperson	A	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.
Autocar (2 cyl.)	A	Arc.	A	Arc.	A	Arc.	A	Arc.	A	Arc.
" (4 cyl.)	A	Σ	A	E	A	Arc.	A	Arc.		
Avery			A	E	A	E	A	A	A	A
Bessac	A	A	A	A	A	A	A	A	A	A
Buick (2 cyl.)	A	A	A	A	A	A	A	A	A	A
" (4 cyl.)	A	Arc.	Arc.	A	A	Arc.	A	Arc.	A	Arc.
Cadillac (1 cyl.)	B	A								
" (4 cyl.)	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.
Cartercar	A	A	A	E	A	E	A	E	A	E
" Con't	A	A	A	E	A	Arc.	A	Arc.	A	Arc.
Case					A	A	Arc.	A	Arc.	
Chalmers	Arc.	Arc.	Arc.	Arc.	A	Arc.	Arc.	Arc.	Arc.	Arc.
Chase	B	B	B	B	B	B	B	B	B	B
Cole			Arc.	A	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.
Columbia	A	E	E	E	A	A	A	A		
" "Knight"							A	A	A	A
Couple Gear	A	A	A	A	A	A	A	A	A	Arc.
Daimler	A	E	A	E	A	E	A	A	A	A
" "Knight"					A	A	A	A	A	A
Darracq	A	E	A	E	A	E	Arc.	Arc.	Arc.	Arc.
De Dion	B	A	B	E	A	A	B	A	B	A
Delaunay-Belleville	B	A	B	A	A	B	A	B	A	
Elmore	A	A	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.		
E. M. F.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.		
Fiat	B	A	A	A	B	A	A	A	B	A
Flanders			E	E	E	E	Arc.	Arc.		
" (6 cyl.)									Arc.	Arc.
Ford	E	E	A	Arc.	E	E	E	E	E	E
Franklin	B	E	B	Arc.	A	Arc.	A	Arc.	A	Arc.
" Con't	B	A	B	A	B	A	A	Arc.	A	Arc.
G. M. C.										
Gramm					A	Arc.	A	Arc.	A	Arc.
Grasm-Logan	A	Arc.	A	Arc.						
Herreshoff	A	A	Arc.	Arc.	A	Arc.	A	Arc.	A	Arc.
Hewitt (2 cyl.)	A	A	A	A	A	Arc.				
" (4 cyl.)	A	E	A	E	A	Arc.	E	E	E	E
Horlmon			Arc.	Arc.	A	Arc.	A	Arc.	A	Arc.
Haynesobile "30"	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.
" "33"									A	Arc.
I. H. C. (air)									B	A
" (water)									A	A
International	B	A	B	A	B	B	B	A		
Interstate	A	E	A	E	A	Arc.	A	Arc.	A	Arc.
Isotta	A	A	A	A	A	A	A	A	A	A
Italia	A	A	A	A	A	A	A	A	A	A
Jackson (2 cyl.)	A	A	A	A						
" (4 cyl.)	A	E	A	Arc.	A	Arc.	A	Arc.	A	Arc.
Kelly					Arc.	Arc.	A	Arc.		
Kelly Springfield									Arc.	Arc.
Kissel-Kar	A	E	A	E	A	Arc.	A	Arc.	A	Arc.
" Con't									A	Arc.
Kline Kar			Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.
Knox	B	A	B	A	B	A	B	A	B	A
Krit			A	A	A	A	A	A	A	A
Lancia	B	A	B	A	B	Arc.	B	Arc.	B	Arc.
Locomobile	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.
Lozier	A	A	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.
Mack	A	E	A	E	A	E	E	E	E	E
Marion	A	E	A	E	A	E	A	Arc.	A	Arc.
Marmon	Arc.	Arc.	A	E	A	Arc.	A	Arc.	A	Arc.
Matheson	Arc.	Arc.	Arc.	Arc.	A	A	A	Arc.	A	Arc.
Maxwell (2 cyl.)	E	E	E	E	E	E	E			
" (4 cyl.)	E	E	E	E	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.
" (6 cyl.)									Arc.	Arc.
Mercedes	A	E	A	E	A	E	A	E	A	E
" "Knight"					A	A	A	A	A	A
Mercer			A	Arc.	A	Arc.	A	Arc.	A	Arc.
Michigan			Arc.	Arc.	A	Arc.	A	Arc.	A	Arc.
Minerva "Knight"					A	A	A	A	A	A
Mitchell	A	A	Arc.	Arc.	A	Arc.	A	Arc.	A	Arc.
Moon	A	A	E	A	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.
National	A	Arc.	A	A	A	A	A	A	A	A
Oakland	A	E	A	E	A	Arc.	A	Arc.	A	Arc.
Oldsmobile	A	E	A	E	A	Arc.	A	Arc.	A	Arc.
Overland	A	E	A	E	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.
Packard	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.
Paige Detroit			E	E	A	Arc.	A	E	A	E
Panhard	A	E	A	E	A	E	A	E	A	E
" "Knight"					A	A	A	A	A	A
Pathfinder									A	Arc.
Pierlas	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.
Pierce Arrow	A	Arc.	Arc.	Arc.	A	Arc.	A	Arc.	Arc.	Arc.
" Con't					Arc.	Arc.	Arc.	Arc.	Arc.	Arc.
Pope Hartford	A	E	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.
Premier	A	Arc.	A	Arc.	A	Arc.	A	Arc.	A	Arc.
Pullman	A	E	A	E	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.
Rambler	A	A	A	A	A	Arc.	Arc.	Arc.	Arc.	Arc.
Rapid	A	A	A	A	A	Arc.	A	Arc.	A	Arc.
Rayfield							A	A	A	A
Regal	A	E	A	E	A	Arc.	Arc.	Arc.	Arc.	Arc.
Renault	A	Arc.	A	Arc.	A	Arc.	A	Arc.	A	Arc.
Reo	A	A	A	E	A	Arc.	A	Arc.	A	Arc.
S. G. V.					B	Arc.	B	Arc.	B	Arc.
Selden	A	E	A	E	A	E	Arc.	Arc.	Arc.	Arc.
Servicar	A	A			A	Arc.	A	Arc.	Arc.	Arc.
Simplex	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.
Speedwell	A	Arc.	Arc.	Arc.	A	Arc.	A	Arc.	Arc.	Arc.
" "Mead"							A	Arc.	Arc.	Arc.
Stanley	D	D	D	D	D	D	D	D	D	D
Stearns	A	A	Arc.	Arc.	A	Arc.	A	Arc.		
" "Knight"							A	A	A	A
Stevens Duryea	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.
Stoddard-Dayton	E	E	Arc.	Arc.	A	A	A	A	A	A
" "Knight"							A	A	A	A
Studebaker	A	B	E	E	A	Arc.	A	A	A	Arc.
Stutz							Arc.	Arc.	Arc.	Arc.
Thomas	E	E	E	E	E	E	A	E		
Walter	A	E	A	E	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.
Warren Detroit			Arc.	Arc.	A	A	A	A	A	A
White (Gas)			Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.
" (Steam)	D	D	D	D	D	D	D	D	D	D
Winton	E	E	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.

Mobiloil

A grade for each type of motor

The various grades, refined and filtered to remove free carbon, are: **Gargoyle Mobiloil "A", Gargoyle Mobiloil "B", Gargoyle Mobiloil "D", Gargoyle Mobiloil "E", Gargoyle Mobiloil "Arctic."**

They are put up in 1 and 5 gallon ***sealed cans,*** in half-barrels and barrels. ***All are branded with the Gargoyle, which is our mark of manufacture.*** They can be secured from all reliable garages, automobile supply stores, and others who supply lubricants.

VACUUM OIL CO., Rochester, U. S. A.

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THE MARK
Cold Drawn Steel Union

Won't Freeze Onto the Pipe or At Nut or Seat

Because they are Sherardized after threading, a new process which gives surface and threads a "skin" of zinc alloy, on the same principle that case hardening alloys the surface of a metal.

Galvanizing a fitting does not protect threads because threads must be cut after galvanizing is done.

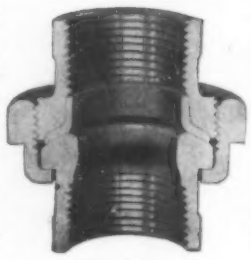
Ends are *tapered* at the threads to the Briggs standard taper of pipe.

This permits screwing up the Mark Union the full depth of threads. When you screw ordinary unions having a straight thread onto taper-thread pipe, only a few threads are in mesh, leaving a nasty pocket at each end to fill with dirt and to corrode and freeze into a solid mass of rust.

Mark Unions Are Cold Drawn From High Grade Box-Annealed Deep Drawing Open Hearth Strip Steel

This is the first time a *rolled* steel product has been used in making a pipe union. All other unions are either gray iron, malleable iron or brass *castings*.

You know the unavoidable defects of any cast article—blow-holes, sand-holes, unevenness, brittleness, etc. All these defects are absolutely avoided in Mark Cold Drawn Steel Unions.



Patents Pending

The last operation on the male end forces the cold metal into the tool steel die with such a tremendous pressure that it *densifies* the seat, rendering it almost glass hard.

When the union is screwed onto the pipe this densified steel seat is pressed into a soft brass seat ring, making an absolutely steam-tight joint.

Only the very highest grade of flawless, tough, homogeneous steel will stand the series of cold drawing and upsetting processes through which the Mark Unions must go. Every draw is a severe inspection test, and every draw also toughens the metal.

Both steel seat and brass seat ring are formed with such absolute accuracy in hard steel dies that no machining is necessary. This means that all Mark Unions of any size are absolutely interchangeable.

These are only a few of the many important points about Mark Unions.

When sending for our literature give us the name and address of the dealer from whom you buy most of your pipe fittings

MARK MFG. CO., 1903 Dempster St., Evanston, Ill.

The department Garage of the NEW YORK CITY

POLICE

was recently ablaze with a serious gasolene **FIRE**

Fortunately—a year ago this garage had been equipped with **ELECTRENE FIRE GUNS**

Electrene resting on cup and held by Clamp

THE FIRE DEPARTMENT —also equipped with

ELECTRENE

responded promptly; but the fire had already been

ELECTRENED

ELECTRENE is an **IMPROVED EXTINGUISHER APPROVED** by U. S. **STEAMBOAT INSPECTION BUREAU STANDARD** of N. Y. **FIRE DEPT.** Write for Pamphlet

ELECTRENE CO.

Whitehall Building **New York City**

Trade-mark Notes

Trade-mark for Wrapped Tooth Picks.—Assistant Commissioner Tennant in the case of Lowenstein v. Herz has affirmed the decision of the Examiner of Interferences canceling trade-mark registration No. 73,562, to Alexander Herz, the Assistant Commissioner holding that the trade-mark, which consists of two short parallel lines made of transverse grillings or corrugations connected by a relatively long line of such corrugations, is but a feature of the package incident to an old and well-known method of sealing the same and so not capable of adoption as a trade-mark.

Color as a Trade-mark Feature.—In the case of *ex parte* DeWitt Wire Cloth Company, the Commissioner of Patents in affirming the decision of the Examiner of Trade-marks to the effect that a trade-mark for wire rope described as a fiber core in the wire rope, which core is colored purple, is not registrable, where it appears that it was old to use cores for such ropes made of asbestos, of fiber soaked in tar and of tarred hemp or Manila rope, refers to certain patents, granted before the applicants claimed date of use, which show wire ropes having fiber cores, and said, "These ropes have a color which, it is true, is different from that said to be used by applicant; but, as pointed out, the registration of this mark would give applicant a *prima facie* right to stop any other person from using a rope having a colored fiber core and for this reason the mark is believed to have been properly refused registration by the Examiner of Trade-marks."

Trade-marks in Cuba and Paraguay.—Consul General James Linn Rodgers, of Havana, advises American manufacturers and merchants to register their trade-marks in Cuba as soon as possible. In Cuba priority of registration gives the exclusive right to use a trade-mark. The consequences of this law have been grievous for more than one manufacturer. For example, the trade-mark of one of the oldest piano firms in the United States was registered by a Cuban dealer and thereby became his exclusive property. Practically the only course left for the piano company is to purchase from this dealer the right to use the mark in Cuba. It is obvious that there is nothing to prevent the registration of popular trade-marks merely for the purpose of making the manufacturer buy the privilege of using his mark in Cuba. Repeated efforts have been made to have this feature of the trade-mark law amended, but thus far without success.

Similar conditions are reported by Consul Cornelius Ferris, Jr., of Asuncion, who writes that American manufacturers should realize the need of protecting their trade-marks in Paraguay by registration. Registration alone gives the right to the exclusive use of a mark in Paraguay. Formerly many American manufacturers thought the possibilities of trade in that country did not warrant the registration of their marks. Now some of these manufacturers have made the unpleasant discovery that when they want to sell their goods there they can not do so without coming to terms with some persons who have already registered the marks of the American manufacturers in question. Since priority of registration is practically the only test as to the right to use a trade-mark, promptness is advisable.

The Hump Trade-mark.—The Court of Appeals of the District of Columbia, in The Hump Hair Pin Company v. The DeLong Hook and Eye Company, has reversed the decision of the Commissioner of Patents sustaining the opposition by the DeLong Company to the registration by The Hump Hair Pin Company of the trade-mark presented, and including the words "the hump," and in so doing held that the fact that two articles are included in one of the classes established by the Commissioner of Patents under the act of May 4th, 1906, does not of itself make these articles of the same descriptive properties; that hairpins and hooks and eyes are not goods of the same descriptive properties because one could not possibly be used for the purpose to which the other is applied so that there could be no confusion in the minds of purchasers.

PATENT ATTORNEYS

PATENTS

If you have an invention which you wish to patent you can write fully and freely to Munn & Co. for advice in regard to the best way of obtaining protection. Please send sketches or a model of your invention and a description of the device, explaining its operation.

All communications are strictly confidential. Our vast practice, extending over a period of more than sixty years, enables us in many cases to advise in regard to patentability without any expense to the client. Our Hand Book on Patents is sent free on request. This explains our methods, terms, etc., in regard to PATENTS, TRADE MARKS, FOREIGN PATENTS, etc.

All patents secured through us are described without cost to the patentee in the SCIENTIFIC AMERICAN.

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ABSOLUTELY FREE for 30 days only. One doz. guaranteed U. S. Fire Extinguishers. Secure territory now. Special offer to but one representative in each section. United Mfg. Co., 1043 Jefferson, Toledo, O.

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FIRST-CLASS Swedish firm with good relations in consuming circles, wants to represent American houses for the introduction of patented articles and novelties for industry and household. Area of activity Sweden, Norway and Denmark. Offers solicited to Harald Westerberg & Co., Gothenburg, Sweden.

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FOR SALE. United States Patent on Windmill regulator. Can be used on windmills of different makes—cheap and simple to make. Terms: cash or royalty. For full particulars address Alfred Ugstad, R. F. D. No. 6, Fergus Falls, Otter Tail Co., Minn.

A PATENT HOE, Serial No. 693,646, is for sale, and interested parties should write for further information. Address J. W. Bush, Leupp, Arizona.

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LEARN TO WRITE ADVERTISEMENTS.—Earn $25 to $100 weekly. We can positively show you by mail how to increase your salary. Prospectus free. Page-Davis Co., Dept. 89, Chicago, Ill.

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A representative of a well known firm in London will entertain propositions for exploiting patented articles for good hand tools or labor saving devices. For further information address Walter H. Cook, 1111 Fuller Building, Broadway and 23rd Street, New York City.

VEGETABLE PEELING MACHINE

DOES THE WORK to perfection—peels raw or boiled potatoes, beets, peaches and any other food products. For further information address Henry Trust, 82 West 91st Street, New York City.

MISCELLANEOUS

FORMULA FOR CLEANING BRICK AND Stonework, prevents white mineral appearing on old or new bricks, makes cemetary work like new, easily applied, inexpensive. Price, $1.00. J. C. Newborg, 47 Brent Street, Dor. Station, Boston, Mass.

INQUIRIES

Inquiry No. 9310. Wanted addresses of manufacturers of good selling articles for mail order business catering to the trade of agents.

Inquiry No. 9311. Wanted names and addresses of manufacturers of hatpin heads made of colored glass; also medals of all shapes.

Inquiry No. 9312. Wanted to buy a machine which will pick up a weight the size of a lima bean by vacuum process. Must be able to pick up dust, gravel, etc. Must be operated by electricity and be easily portable.

Inquiry No. 9313. Wanted to buy Leather Held Horse Shoes used temporarily when shoe cannot be nailed on. In other words a Leather Boot with iron shoe at bottom—strapped over horse's foot.

Inquiry No. 9314. This enquirer is in the market for some patented articles which he could purchase and manufacture with an investment of from $5,000 to $10,000. The name of the party will be supplied to any of our readers on application.

Inquiry No. 9315. Wanted the name and address of a concern manufacturing novelty ink wells.

Inquiry No. 9316. Wanted the names of manufacturers and manufacturers' agents who make patented articles and other useful devices which appeal to the public and which can be used in a mail order business and by canvassers.

Inquiry No. 9317. Wanted the names and addresses of manufacturers of good selling articles that would appeal to the public where exclusive sale in certain territories can be arranged for; both to sell to the trade and through sub-agents in a house-to-house canvas.

Inquiry No. 9318. Wanted rollers and other appliances for extracting water and moisture from refuse, such as coir dust, with special reference for using it as a fuel.

Legal Notes

An Attempt to Mandamus Commissioner of Patents.—In the case of United States *ex rel.* Edward L. Chott v. E. B. Moore, Commissioner of Patents, and A. G. Wilkson, Primary Examiner United States Patent Office, the Supreme Court of the District of Columbia is petitioned to grant a writ of mandamus to cause the issue of a patent to Chott. The application for patent, which relates to a dental broach holder, was finally rejected by the primary examiner and appeal was filed to the board of examiners-in-chief, who reversed the primary examiner's decision upon the ground that the references cited were from a non-analogous art. The examiner thereupon made a further search and rejected the claims upon other references and reasons, and his action re-opening the case for the purpose of introducing additional references was approved by the Commissioner. The Commissioner of Patents also took up the case for personal consideration of the merits of the alleged invention claimed, concluded that the application set forth nothing upon which a patent could properly be based, rejected the claims, refused a patent, and said that appeal from his decision to the Court of Appeals should be taken, if at all, within the time prescribed by the rules of that Court. It is contended in behalf of the petitioner that the authorities cited by him at length render it clear that the primary examiner could do nothing in the application in question, after being reversed by the examiners-in-chief, but allow the application. Further, that the Commissioner has no authority to pass upon the validity and patentability of claims unless the question comes to him by regular course of appeal, and attention is called to the Supreme Court decision in *ex rel.* Miller v. Raum, in which it was held

"When a subordinate officer is over-ruled by his superior officer having appellate jurisdiction over him, his duty to obey the decision of such superior is a ministerial duty which he can be compelled by mandamus to perform."

The case at this writing waits the decision of the Supreme Court of the District of Columbia.

The point involved seems to be whether a favorable decision of any of the tribunals of the Patent Office can be set aside. In a cited precedent there was a strong dissenting opinion, and the writ if issued may affect a practice which prevailed for some time of reviewing cases favorably passed upon by principal examiners and which resulted in withdrawing numbers of applications from allowance or issue.

Bakelite Patent Recognition.—As a result of negotiations between the General Bakelite Company and the Condensite Company of America, the suits brought by the former against the latter and its customers for alleged infringement of the Bakelite patents have been withdrawn, and the Condensite Company, recognizing the pioneer character of Dr. L. H. Baekeland's work, has acknowledged the validity of the Bakelite patents in suit and some others, and will pay substantial royalties thereunder. The General Bakelite Company will continue the manufacture of Bakelite under its numerous patents, and the Condensite Company will manufacture Condensite under the Aylsworth patents as well as the license just granted for such of Baekeland patents as are broad enough to cover Condensite. This recognition of the force and validity of the principal Baekeland patents by the only other manufacturer of condensation products is a confirmation of the Bakelite Company's claims for the broad scope and pioneer character of these patents. There is much that is old in the art of making phenolic condensation products, but Dr. Baekeland was the first to make practical application of what theretofore had been chiefly laboratory experiments.

Some Adjudicated Patents.—In Houser v. Starr, claim 3 of the Starr patent, No. 533,095, for a drawing instrument has been held not infringed; the Cheatham patent, No. 612,702, for a switching device has been held valid and infringed in Cheatham Electric Switching Device Company v. Transit Development Company; the Claude and Hess patent, No. 664,383, for apparatus for storing and distributing acetylene gas expired June 30th, 1910, with the expiration of the British patent, No. 29,750 of 1896, to same patentees for same invention; also held not infringed in Commercial Acetylene Company v. Schroeder: the Richardson and Langston patent, No. 669,489, for an improved railroad mileage ticket was held not infringed in Exchange Scrip Book Company v. Rand, McNally & Co.; the Starr patent, No. 683,809, for a cutting instrument has been held valid and infringed as to claims 11, 19 and 20 and void for lack of invention as to claims 1, 10, 12, 14 and 21 and not infringed as to claims 16 and 17 in Houser v. Starr; in St. Clair Foundry Company v. Union Jack Company claims 2 to 5 inclusive of the Cox patent, No. 686,591, have been held void for anticipation in the prior art and claim 1 not infringed if conceded to be valid; the Merz patent, No. 722,030, for a combined electric measuring and indicating apparatus has been held not anticipated, valid and infringed in Minerallac Electric Company v. Cleveland Electric Illuminating Company; the Starr patent, No. 766,158, for a machine for cutting curves has been held void as to claims 9, 10, 12 and 13 for lack of invention over a prior patent to the same patentee in Houser v. Starr: in Cheatham Electric Switching Device Company v. Transit Development Company, the Cheatham patent, No. 917,541, for a switching device has been held valid and infringed and the Lawson patent, No. 983,295, for a gem setting has been held void for lack of patentable invention in Lawson Metal Products Corporation.

The Court of Appeals of the District of Columbia in the case of the Commissioner of Patents, *ex rel.* Colburn Machine Glass Company, has held that a mandamus issued by the Supreme Court of the District of Columbia, compelling the Commissioner of Patents to vacate certain proceedings in the Patent Office, was improperly granted, since under the circumstances of the case the Commissioner had authority to do the thing complained of.

Some Adjudicated Patents.—In the case of Union Tank Line Company v. American Car and Foundry Company, claims 14, 15, 16 and 17 of the Van Dyke patent, No. 768,888, have been held valid and infringed. The Burger patent, No. 872,795, for improvement in double-walled vessels has been voided for lack of invention in American Thermos Bottle Company v. American Ever-Ready Company. In Westinghouse Electric and Manufacturing Company v. Sutter, the Stanley patent, No. 469,809, for a system of electric distribution was held not infringed; in Oehring v. William Gardam & Son, claims 1 and 3 of the Oehring patent, No. 560,171, were held valid and infringed; in Emerson & Norris Company v. Simpson Bros. Corporation, the Stevens patent, No. 624,563, for a process of making artificial stone was held valid and infringed; in Metal Stamping Company v. Gerhab, the Worrest patent, No. 662,050, for a thill coupling was held not infringed; the Tingley patent, No. 787,010, for a patch for rubber tires was held invalid for prior use of the device by others in Horsey v. Consumers' Auto Supply Company; and that the Robertson design patent, No. 29,993, for a design for a bath-tub seat was held invalid for lack of patentable novelty and invention and also of the ornamental quality essential to a design patent in Buffalo Specialty Company v. Art Brass Company.

Font of Type Design Case.—Assistant Commissioner Tennant, in *ex parte* Weatherly, has held that when a design for a font of type differs from the references principally in making the heavier lines heavier and the lighter lines lighter and the ceriphs sharper, and the change on the whole gives the type a more pronounced or bolder effect, and it is shown by affidavits that the type has been recognized by the trade as having a distinctive face, that such design is new and ornamental and that its production required the exercise of the inventive faculties, and the Assistant Commissioner reversed the decision of the Examiners in Chief and allowed the application for design patent.

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Price Maintenance and Modern Merchandising—II

How Price Maintenance Benefits the Public

By Waldemar Kaempffert

[THIS is the second of a series of short articles intended to set forth in a simple way the economic necessity of fixing and maintaining the retail price of certain kinds of manufactured products. Merchandising methods have changed in the last twenty years—changed chiefly because nation-wide and world-wide selling has been made possible by advertising. In this remarkable development of business, economic discoveries have been made which are not yet widely known. It is the purpose of these articles to set forth these discoveries so far as they affect price maintenance.— EDITOR.]

Independent manufacturers insist that the more efficiently and widely their goods are distributed, the greater is the benefit to the public. If hardware is concentrated either in storerooms or in a few large department stores, it is made difficult for the buyer to purchase. He must always rely on the nearest distributing point. If that distributing point happens to be a department store several hundred miles away, he is delayed, often needlessly, in satisfying his wants. Distribution is the art of reaching the consumer; not the art of making the consumer reach the manufacturer.

The modern merchant realizes that the greater the number of retailers who handle his goods, the more accessible will his wares be to the public, and, therefore, the simpler will be the problem of distribution. But to secure the widest possible distribution, the many retailers who exhibit his wares for sale must stand on an equal footing. In other words, they must all be able to buy at the same wholesale price; they must all sell at the same retail price.

That end is attained by so adjusting the selling price of an article that it yields a fair profit to the manufacturer and his distributors, and yet induces the public to buy because it is low. The selling price must be maintained, so that the Broadway shop deals with the public on the same terms as the general store of a village.

Rural communities should not be obliged to pay more for merchandise than people who dwell in cities, yet with open prices they are often compelled to do so. A widely-advertised watch that sells for a dollar all over the United States competes with a watch of about the same commercial value, but which is not sold at a fixed price. While the dollar watch in question can be bought anywhere at one price, and the retailers who sell it all make the same profit when they buy it in the same quantities, the competing watch is sold in the larger cities by the larger dealers at 98 cents and elsewhere at prices ranging from $1 to $1.25.

What happens when prices are cut and goods are sold at a distinct loss by a mail-order house or a chain store? Suppose that you need a dozen new blades for your safety razor. You have been accustomed to paying one dollar for them—a price which has been established because it means a fair profit to the manufacturer and to the retailer. A chain store in your town advertises that it is selling for 68 cents the very blades for which you have been accustomed to pay $1. The saving is considerable, and accordingly you buy your blades at the chain store.

When next you have occasion to buy a dozen safety razor blades, you find that the corner druggist from whom you once bought no longer carries them in stock. Why? He was unable to compete with the chain store. The chain store has long since ceased to advertise the razor blades. Still, you try to purchase a set there. At the cutlery counter you are told that the razor blades are no longer carried in stock. If you want a set you must write directly to the manufacturer for them.

While this is a hypothetical experience it is one that actually occurs frequently. Only the price of a very widely-advertised article is cut, one which is bought because of its acknowledged merit, one which is guaranteed by a reputable maker. If the retailer finds the demand for that article suddenly extinguished because a department store is offering it at less than cost, he is compelled to discontinue its sale. His stock is usually so small that he cannot sell other less well-known goods at so large a profit that he more than reimburses himself for any loss that may be incurred by selling a widely advertised razor blade at less than cost. Thus, the citizens of a small country town who were at one time able to buy a thousand different advertised wares—hats, shoes, hardware, and package food-stuffs—at exactly the same price as the citizens of every other community in the country, are compelled to deal with a distant mail order house. And thus the way to a distributing trust is paved, a trust composed of department stores and mail order houses, who may dictate to manufacturers.

If the mail order houses, the department stores, and the chain stores were willing to sell well-known guaranteed articles at a loss, year in and year out, if manufacturers were willing to countenance this trade on their own good name, it might be possible to advance an argument or two in favor of the practice. But price cutting continues only for a short time. Its chief purpose is to attract trade, to give the impression that other articles, on which great profits are made, are sold at an equally low rate. When that purpose is attained the price-cutter drops the undersold article from his stock. Hence the public finds it very hard to buy the desired goods at any price.

Spruce Gum

SPRUCE gum is one of the minor forest products which is generally not taken into consideration by the forester in this country. In Europe a strict account is kept of such small incomes and an effort is made to develop the minor yield, together with the major products. The gathering of the spruce gum constitutes an odd phase of the north woodsman's life and to him often represents a comfortable livelihood. Spruce gum is a product of red spruce of the northeastern States. Maine, New Hampshire, and Vermont contribute largely toward the annual yield. The gum oozes out through abrasions in the bark, usually caused by borers and frequently by cracks or checks in the bark due to the unequal thawing after excessive cold of the winter. The resinous substance which nature provides for plugging up the holes or cracks in the bark comes through and often forms various fantastic shapes upon the bark of the trees. At first it is soft whitish and pitchy, but after the intense cold of the first winter it becomes hard and changes to a darker hue. After the first year it commences to turn red, when it is fit to be gathered for market.

The gum picker frequently spends some time during the spring going about marking and scarring the trees, so as to make sure of finding enough gum to pay for his labor when he calls around a year or two later. This is done by climbing a thrifty tree to above the old limbs and high in the sunlight, and scarring the south side of the trunk between the whorls of branches with deep incisions shaped like the letter V. Making artificial provision for the exudation of spruce gum in a systematic method has only recently come into practice. Healthy, thrifty trees rarely have gum on them. It is found on trees that have become stunted from some injury, or are infested by insects, or otherwise diseased. Occasionally one will find a tract where nearly all spruces yield gum.

It is said that the best gum picker can, under favorable conditions, collect in a day from 8 to 10 pounds of crude gum, though from 3 to 5 pounds constitute a fair day's work. By the time the gum is

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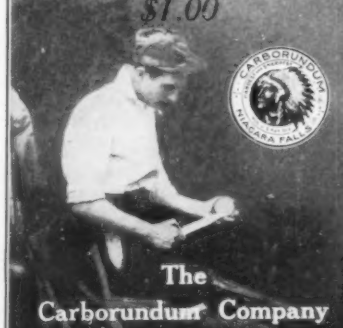

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THIS letter was addressed to the *Scientific American* on April twenty-ninth, 1913, and was written by Mr. A. L. Carter, Production Engineer of the Bower Roller Bearing Company, Detroit, Michigan:

"Relative to NON-GRAN bearing bronze we beg to advise that we are using this bearing metal, supplied by the American Bronze Company of Berwyn, Pennsylvania, in our grinder spindles. The speed on these spindles (in internal grinders) runs up to 14,000 R. P. M. The spindles are 15/16" diameter, or approximate spindle speed of 3,400 F.P.M. Our first spindle, using NON-GRAN bronze, stood up very much longer than we expected and at the end of two and one-half months' continuous running, averaging twelve and one half hours per day, was removed as there was a wear of about .0015. It is very necessary that there is no shake in our spindles and we are getting very good results indeed from the continued use of NON-GRAN as compared to the other bearing bronzes we have used."

AND this is why NON-GRAN bearings provide longer silent action, greater efficiency and greater life to any motor or machine.

WITH the aid of a microscope, you will see that the polished surface of a bearing, instead of being one solid piece as it appears to the naked eye, is, in reality, composed of billions of minute particles. Now these particles are constantly being pulled at by the friction of the shaft revolving against them. Just as your hand would be pulled were you to hold it around a rapidly revolving shaft.

THE reason a bearing wears out is because these particles cannot resist this pull and are torn away from the billions of particles immediately back of them. As this tearing away of particles goes on, the inside diameter of the bearing keeps getting larger and larger until it no longer holds the shaft snug.

Whether or not a bearing will show rapid wear, depends upon the *structure* of the bronze and how well the constituent particles can *resist* frictional pull.

THE structure of NON-GRAN bronze is the direct opposite of the granular structure of other bronzes in which the particles have no holding bond between one another.

THE structure of NON-GRAN bronze is non-granular, it is fibrous. The particles in its construction are all knit together in a solid mass so that friction on the bearing surface cannot pull the particles from their tightly interlocked positions.

THE particles of a NON-GRAN bearing are thus absolutely secure against all normal frictional pull, and give way *only* to the very occasional abnormal pulls such as would be caused by tremendous continued shaft pressures or the almost complete absence of lubricant.

IT is clear, therefore, that the reason NON-GRAN bearings stand up for from three to five times longer than bearings of any other bronze is because NON-GRAN gives way *only* to *abnormal* friction.

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cleaned it will shrink about one fifth in weight, which is worth from $1 to $1.50 a pound. The best grades of gum frequently bring $2 a pound. Bangor, Maine, is the principal trading point for spruce gum. Many tons of it are shipped from here every year, and the bulk of it is sold in New England, where the gum chewers much prefer the spruce gum to that kind which is manufactured from paraffin and other kinds of wax.

Novel Uses of Compressed Air

(Concluded from page 9.)

S, only one being shown, and opposite to them there are two idler rods, designated *I*, which are differentially geared to the shifter rods through the pinion *G*. The selector finger *F*, which is made integral with the piston rod *P R* the piston *P* and the long pinion *P L* fits into slots in these shifter rods and idler rods when rotated through the smaller pinion meshing with the pinion *P L*; this smaller pinion is connected to the steering column indicator.

The air distributer is controlled by the clutch position. With the clutch engaged, the valve is closed; when the clutch is disengaged the valve is in the position shown admitting air behind the piston and forcing it back. In action, a neutral collar on the piston rod, on its backward movement, throws all the rods to the neutral position. Depression of the clutch pedal first closes one port and then opens communication with the other, forcing the piston forward, the selector finger drawing the rod selected by the steering column indicator. The action of the device, therefore, is first to place the gears in the neutral position on the downward pressure of the clutch pedal and then to engage the gear indicated by the steering column indicator on the upward movement of the clutch pedal. It is possible, however, to slip the clutch, without the necessity for changing the gears, a certain amount of leeway being provided for this purpose.

The particular advantage of any system of the kind, aside from the fact that it eliminates a certain amount of manual labor is that it permits the driver to have both hands on the steering wheel at all times. It also is possible to anticipate a gear shift. In ascending a hill, for instance, the steering column indicator is set for intermediate speed while the car is running on high gear and then the next time the clutch pedal is fully depressed, intermediate gear automatically is engaged without further work on the part of the driver. To prevent reverse gear being engaged when the car is running forward, the reverse position is protected by a latch and to facilitate night driving the indicator is illuminated by a small electric light.

Fuel Production in the United States

(Concluded from page 10.)

underlie North Dakota (besides a vast tonnage in other States) until recently was considered to be worthless for anything but the most local consumption. It is now known that all this coal ranks high as a gas-producer fuel, being more efficient in the gas-producer engine than the best Pocahontas coal under the ordinary steam boiler, and furthermore that it can be made into high-grade briquet fuel by simple pressure, without the use of the expensive "binder." Again, our present total estimate of thirty-two hundred billion tons of coal in the United States (exclusive of the great deposits of Alaska) takes into consideration coal to the depth of only 3,000 feet. Coal lying beneath that depth is classified by the Geological Survey as "non-coal," however thick the seam or high-grade the quality. Yet Belgium is operating a mine but a few feet short of 4,000 feet in depth, and Germany estimates her coal reserve on the basis of a 5,000 feet depth.

Finally, approaching the subject from the slant of the most economical use of the ton of coal after it is mined and delivered to the power plant or the factory; only a small proportion of the stored

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The Ten Greatest Inventions of Our Time

We hear much of the great inventions of the past—the telegraph, the sewing machine, the telephone, the reaping machine, photography, Bessemer and open hearth steel, the steam engine and the phonograph. Yet the inventions of our own time are as epoch-making and as dramatic as these.

Perhaps because we have become accustomed to the use of the old machines and discoveries, perhaps because the achievements of latter-day inventors succeed one another so rapidly that we are not given much time to marvel at any one of them, we have not fully realized how stirring and wonderful are the products of modern ingenuity.

Only five years ago the man-carrying aeroplane made its first public flights; only the other day hundreds of passengers on a sinking ship were saved with the aid of wireless telegraphy. At least a dozen inventions as great have been perfected in our own time, and all of them have made a man's work count for more than it ever did before, and have made the world more livable than it ever was.

Why should we not tell the story of our own deeds? Why should we not review the industries created by men who are still living, men whose names will go down into history with those of Watt, Morse, McCormick and Howe?

That was the underlying idea of the November Magazine Number of the Scientific American. We knew that the "ten greatest inventions of our time" was a big subject when first we planned the number, but how big it was we never realized until we surveyed the field of modern invention.

Then we saw how astonishing was the progress made in our own day, how much mankind had benefited by the inventions of great modern intellects. We began to appraise inventions, to weigh one against the other, and to determine in our own minds which ten had contributed most to human progress and happiness, which were really great pioneer inventions, and which merely remarkable and valuable improvements on successful past conceptions. There were so many achievements to consider that it was hard to arrive at a definite conclusion.

The upshot of our own thinking has been to leave to our readers the decision

What Are the Ten Greatest Inventions of Our Time, and Why?

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Second Prize: $100.00 for the second best article
Third Prize: $50.00 for the third best article

On another page of this issue are printed the rules that will govern the contest.

energy in the coal lump is utilized to-day; the railroads use annually about 90,000,000 tons, yet it is estimated that not more than 10 per cent of this energy is utilized to drive the engine wheels; and this is far more than formerly. No one can doubt that during the next generation there will be vastly more use and less waste in every phase of the industry, ranging all the way from the mining, to the final application of the power. The present up-to-date plant, for instance, burns its smoke and saves the power it was wont to waste into the atmosphere, a saving in some cases of 10 per cent of the fuel bill and a greater gain to the public in the absence of dirt. Directly and indirectly the smoke nuisance is estimated to cost the country between $250,000,000 and $300,000,000 annually.

Observations of the Companions of Sirius and Procyon

IN No. 648 of the *Astronomical Journal* Prof. E. E. Barnard of Yerkes Observatory publishes his results on his "observations of the companions of Sirius and Procyon." Because of the great brightness of the principal star in each case which is particularly troublesome when the air is not perfectly steady, conditions have seldom been good for observing for such objects as the companions of Sirius and especially the close companion of Procyon.

In the present observations of Sirius it has seldom been necessary to use the hexagonal diaphragm (A. N., 4345), though the satellite is always better seen with it. Under good conditions the small star is a very bright and conspicuous object. A little disturbance in the air, however, makes it faint or invisible. The following are the measures of the companion of Sirius:

Date.	P. A.	Dist.	Remarks.
1913.051	82.34	9.96	15 nights

Schaeberle's Companion of Procyon.

Schaeberle's companion of Procyon is a far more difficult object than the companion of Sirius. It requires the best condition even to see it. At the present measures, though difficult to observe, it seemed to Prof. Barnard to be brighter than for some years past. The hexagonal diaphragm was a great help in its observation, and was invariably used. The companion is now perhaps slowly closing in on the bright star, as indicated by the measures. If this is true, observations of it will become more difficult and perhaps impossible later, until it is again favorably placed in its orbit. The angular motion of the small star seems to be increasing somewhat and is now between 5 degrees and 6 degrees a year. Following are the measures of Schaeberle's companion:

Date.	P. A.	Dist.	Remarks.
1913.162	42.56	5.09	3 nights

The Current Supplement

THIS week's issue of our SUPPLEMENT brings an article of unusual importance and interest from the pen of Prof. Birkeland, who has become famous as the foremost among the rather small body of men to whom the new industry of the manufacture of nitrates from the air owes its existence. Prof. Birkeland has achieved greatness not only in the world of applied science, but also in the prosecution of researches of a purely scientific character. For some time past he has been conducting a remarkable series of experiments in which he has reproduced on the laboratory scale certain phenomena observed on the sun, such as the corona, the sunspots, etc. His article on "The Origin of Worlds" is one of the most remarkable publications which we have had occasion to place on record for some time past.—H. F. J. Porter writes on life hazards in crowded buildings and the means to be employed to reduce such risks to a minimum.—A Diesel engine of French manufacture is described.—Dr. J. J. Dobbie tells us of the services which the spectroscope has rendered the organic chemist.—A. S. Rogers describes a modified reciprocator for lathes.

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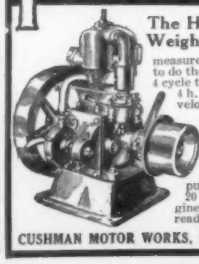

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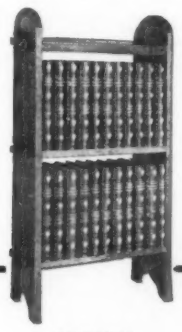

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(12820) E. N. asks: Kindly tell me what is the velocity of electricity, and also the velocity of light. A. The velocity of electrical waves through space is the same as that of light. The velocity of a current of electricity over a wire is very much slower. It varies with the intensity of the electricity and the size of the wire.

(12821) W. F. F. asks: A light ball, when placed in a strong jet of air issuing from the orifice of a nearly vertical pipe, will find a position of equilibrium and remain there suspended, even if the axis of the pipe be inclined as much as 45 degrees to the vertical. The same thing occurs if other fluids be used, as air, steam, etc., but the maximum angle of inclination decreases with increasing density of the fluid. Why is this? A. The singular rotation of a ball upon a jet of air or water is explained by the adhesion of the fluid to the ball, both rotating the ball and drawing the jet around the ball in the direction in which the ball rotates, thus tending to hold the ball in contact with the stream of water or air.

(12822) J. C. A. asks: In the case of lofty adjacent buildings separated by a narrow lane, is the light in each increased by painting white the walls of eac building facing on lane referred to? It should be noted that the sides of the buildings facing on lane are penetrated by many windows. There is undoubtedly a sensation of the entrance of more light, but is this sensation, for want of a better term, more illusory than real? How much of this apparent improvement is due to the frequent and involuntary glances of workers on the white walls opposite their windows, which were formerly red, and how much is genuine increase in the volume of light indoors? Has the effect of so lightening the color of the walls ever been scientifically determined or measured? A. The effect of the color of the surrounding walls upon the lighting in an inclosed area, like the space between tall buildings, is very marked. Experiments carefully conducted show that a white wall will give back about fifty per cent of the light which falls upon it, while a red wall will only give back fifteen per cent of the light it receives.

(12823) E. E. H. asks: 1. Will you publish an account in the SCIENTIFIC AMERICAN of the method used in graduating surveyors' instruments, transit, sextants, etc., into degrees, minutes, etc.? A. The circles of transits and other surveying instruments are graduated by the dividing engine, which has an accurately divided circle and a tool which graves the lines as the circle which is to be graduated is turned around under this tool. Your question seems to refer to the method of making the dividing engine rather than to the dividing of a circle with it. The only difficulty lies in getting the first circle divided accurately. After that the copying of this circle presents no difficulties. If you wish to start at the beginning and graduate a circle with dividers, you should determine the simple divisions first, the half, quarter, and sixth. Then divide these into halves, thirds, etc., till you have very small divisions left, which can be divided by compasses into the ultimate divisions. In this way the errors will be distributed around the entire circle and will not accumulate, as they will by spacing off a long distance with the dividers. This will prove a simple way to proceed, although there are other modes of proceeding. 2. How is the vernier made for each? I cannot find anything that explains this. A. A vernier is usually made by taking a certain number of spaces on the scale and dividing them into one more space. Thus, if the circle were divided into half degrees, or 30-minute spaces, a vernier to read single minutes would be constructed by taking 29 spaces of the circle and dividing it into 30 spaces. This gives what is called a direct-reading vernier, which is the form usually found on instruments.

(12824) J. M. B. asks: Last Sunday, June 1st, I saw electric waves on a telegraph line. Will you please tell me if there is any record of electric waves having been seen before that date? The waves go in dots and dashes. Since Sunday I can see these flying waves when I take time to look for them. A. If electric waves were able to affect the eye, they would be seen as light, and could not be distinguished from light. The waves used in the wireless and other modes of telegraphing are many times longer than those which can be recognized by the eye. We would suggest that what you saw on the telegraph wires was light shimmering from the bright wire, an effect which in scientific language is called diffraction. The appearance might be just as you describe it, an intermittent trembling of the light as the wire moved slightly in the air, while the sun shone upon it. The longest wave the eye can detect is 3 ten thousandths of an inch in length. The shortest electrical wave thus far produced is about 11 hundredths of an inch in length, or nearly 400 times as long. Some time men may find out how to produce such short waves directly, but it can not be done to-day.

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NEW BOOKS, ETC.

THE GASOLINE MOTOR. By Harold Whiting Slauson, M.E. New York: Outing Publishing Company, 1913. 16mo.; 163 pp.

This is a primary discussion of motor types, valves, ignition, lubrication, etc., written for the man who wants to know how and why.

THE MAN AND THE WOMAN. Chapters on Human Life. By Arthur L. Salmon. Chicago: Forbes & Co., 1913. 12mo.; 145 pp. Price, 75 cents.

THE POSTURE OF SCHOOL CHILDREN. With Its Home Hygiene and New Efficiency Methods for School Training. By Jessie H. Bancroft. New York: The Macmillan Company, 1913. 8vo.; 327 pp.; illustrated. Price, $1.50 net.

The author has given us a very thorough discussion of posture in its relations to energy and health. The dangers of "overcorrection" are pointed out, and it is sought to inculcate true ideals by plates reproducing paintings and sculptures showing natural and graceful modes of standing and walking.

MOVING PICTURES. How They Are Made and Worked. By Frederick A. Talbot. Philadelphia: J. B. Lippincott Company, 1912. 8vo.; 340 pp.; illustrated. Price, $1.50 net.

The numerous branches of moving-picture art and industry are popularly described. The methods used in trick pictures are exposed, and there is an explanation of the talking and singing motion picture, showing how movement and sound are synchronized.

POULTRY FOODS AND FEEDING. A Manual for all Breeders. By Duncan Forbes Laurie. New York: Cassell & Co., Ltd., 1912. 8vo.; 188 pp. Price, $1 net.

Part I concisely conveys the experience of the author in foods and feeding. Part II is for those who desire to go more deeply into the matter, and gives a brief outline of the chemistry of foods with extracts from leading authorities.

PANAMA AND WHAT IT MEANS. By John Foster Fraser. New York: Cassell & Co., Ltd., 1913. 8vo.; 291 pp.; with map and 48 plates from photographs. Price, $1.75 net.

"It is a big thing. The world is looking on," says the author. And his way of putting things and his instructive photographs enable the reader to look on from a point of vantage. The men, the machinery, the accomplished work, will be sharply defined and real to him who reads the story.

DYKE'S AUTOMOBILE ENCYCLOPEDIA. Third Edition, Revised and Enlarged. In 40 Parts. Containing 239 Charts with a Dictionary and Index treating on Construction, Operation, Repairing of Automobiles and Gasoline Engines. By A. L. Dyke, E.E. St. Louis: A. L. Dyke. 4to.; 560 pp.; illustrations and 239 full-page charts. Price, $3.

The author claims to have published the first book in America on automobiles—a treatise called "Diseases of a Gasoline Automobile and How to Cure Them." However that may be, there is no denying that his encyclopedia is a most helpful guide for any amateur to possess; that it teaches the construction of parts, the principles of operation, the diagnosis of troubles, and the application of remedies in a concise and easily understandable way.

SCIENCE FROM AN EASY CHAIR. A Second Series. By Sir Ray Lankester, K.C.B., F.R.S. New York: Henry Holt & Co., 1913. 8vo.; 412 pp.; 55 illustrations. Price, $2 net.

Those general readers who have seen the first series of these chatty lessons will not be disappointed in this second volume. Rich in information, it is still richer in suggestion, and should be placed in the hands of all those whom it is desired to interest in natural science. In stating that the papers deal with such subjects as the problem of the galloping horse, the jewel in the toad's head, food and cookery, smells and perfumes, kisses, laughter, and fatherless frogs, we give some idea of the scope of the work.

THE LIVING PLANT. A Description and Interpretation of Its Functions and Structure. By William F. Ganong, Ph. D. New York: Henry Holt & Co., 1913. 8vo.; 478 pp.; illustrated. Price, $3.50 net.

The first thing that impresses us on taking up this volume is the excellence of its mechanical makeup; and a perusal of the contents soon convinces us that the author has excellently developed his theme. It is a book frankly intended for the learner, and goes to the bottom of things even to the extent of sacrificing brevity to explicitness. It abounds in unusual illustrations, and is at all times so appealing as to create a veritable enthusiasm in the reader.

THE MOTOR AND THE DYNAMO. By James Loring Arnold, Ph.D. Easton, Pa.: The Chemical Publishing Company, 1913. 8vo.; 178 pp.; illustrated.

This is a text book designed to convey the more important facts of electrical theory. It embodies the results of years of experience in teaching, and modern types of machines are presented in sharp illustration and clear description.

THE NEW INTERNATIONAL YEAR BOOK. A Compendium of the World's Progress for the Year 1912. New York: Dodd, Mead & Co., 1913. 8vo.; 822 pp.; illustrated.

This Year Book, though international in scope, makes an especial appeal to American readers by its full treatment of American subjects. The presidential campaign, for example, which accentuated new issues and presented new phases of interest, is dealt with at length. Other timely discussions include the Titanic disaster and the question of safety at sea, the Balkan war, railway accidents, minimum wage and workingmen's compensation, the synthesis of rubber, and the Panama canal.

CALCULATIONS ON THE ENTROPY-TEMPERATURE CHART. By W. J. Crawford, D.Sc. Philadelphia: J. B. Lippincott Company, 1912. 12mo.; 74 pp.; 52 illustrations.

These explanations are written for students who have lacked time or opportunity to delve deeply into underlying principles. To quote the author, "It is absurd to refuse to teach the use of a spade to a child because he does not understand all the processes of its manufacture."

PRACTICAL LOCOMOTIVE OPERATING. By Clarence Roberts and Russell M. Smith. Philadelphia: J. B. Lippincott Company, 1913. 12mo.; 292 pp.; 92 illustrations in text and 5 inserts. Price, $2 net.

Mr. Roberts is assistant road foreman of engines, and Mr. Smith is air-brake instructor, both of the Pennsylvania Railroad. Their handbook gives, for the benefit of engineers and firemen, the latest practice in running and firing, with particular reference to the types equipped with superheaters, brick arches, and improved valve gears.

THE MAKING OF A GREAT CANADIAN RAILWAY. By Frederick A. Talbot. Philadelphia: J. B. Lippincott Company, 1912. 8vo.; 349 pp.; illustrated. Price, $2.50.

Canada is repeating in many ways our own earlier triumphs over waste and wild. The author spent the greater part of the year 1910 in traversing—by pack-horse and canoe when other means failed—the route of the Grand Trunk Pacific. So intimately did he mingle with the engineers, teamsters, and graders, that his recital of their labors and their conquests is very appealing. It is not so much the technical details of the work which he gives us, but the main features of the undertaking in their relation to human endeavor.

THE THEORY OF ENGINEERING DRAWING. By Alphonse Adler, B.S., M.E. New York: D. Van Nostrand Company, 1912. 8vo.; 312 pp.; illustrated. Price, $2 net.

The subject-matter of this text-book is for the most part identical with that usually presented in treatises on descriptive geometry, but the author believes his title to be more clearly indicative of the ultimate purpose of the book. In it he aims to correct certain weaknesses in the theory of descriptive geometry as usually set forth. He reverses the accepted order of starting with a set of definitions and with point-projection, and of building upon this foundation the theory of projection of lines, surfaces, and solids, and instead first considers the concrete object, leading from that to a study of its bounding lines and surfaces.

A TEXT-BOOK OF DESIGN. By Charles Fabens Kelley and William Luther Mowll. Boston: Houghton, Mifflin Company, 1912. 8vo.; 134 pp.; illustrated. Price, $2 net.

The writers address themselves first to the student of early college years, and secondly to all who may be interested in learning the canons of good taste in art and in establishing within themselves acceptable standards of judgment.

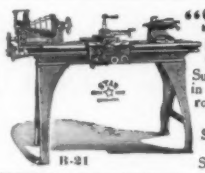
THE BUILDING AGE HANDY ESTIMATE BLANKS. Compiled by Arthur W. Joslin. New York: David Williams Company. Price, 25 cents each; $2.50 per dozen.

"The New Building Estimator" comes to us in vastly improved form. It is in flexible leather binding, with gilt edges, and there are many additional chapters, covering reinforced concrete, millwork, glass, hardware, painting, plumbing, heating and lighting, and ornamental iron work. It deals first with approximate estimating, and afterward with detailed estimating, thus aiding in the first instance the estimator who has to arrive at approximate results in a minimum of time, while the second section of the work goes into matters with great thoroughness and accuracy.

THE MAKING OF THE EARTH. By J. W. Gregory, F.R.S., D.Sc. New York: Henry Holt & Co., 1912. 16mo.; 256 pp.; illustrated. Price, 50 cents net; by mail, 56 cents.

MANUAL OF QUALITATIVE ANALYSIS. Reagent and Combustion Methods. By Wilbur F. Hoyt, A.B., A.M. New York: The Macmillan Company, 1913. Price, 30 cents.

THE "SHIPPING WORLD" YEAR BOOK. 1913. A Desk Manual in Trade, Commerce, and Navigation. Edited by Evan Rowland Jones. London: The "Shipping World" Offices, 1913. 8vo.; 1848 pp.



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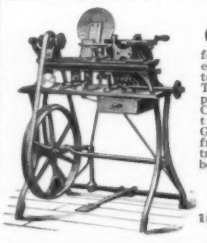
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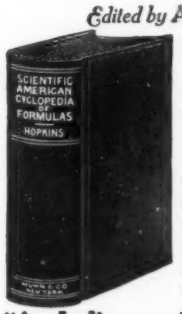

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